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Annual report

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*Office at Lansing, Michigan.*

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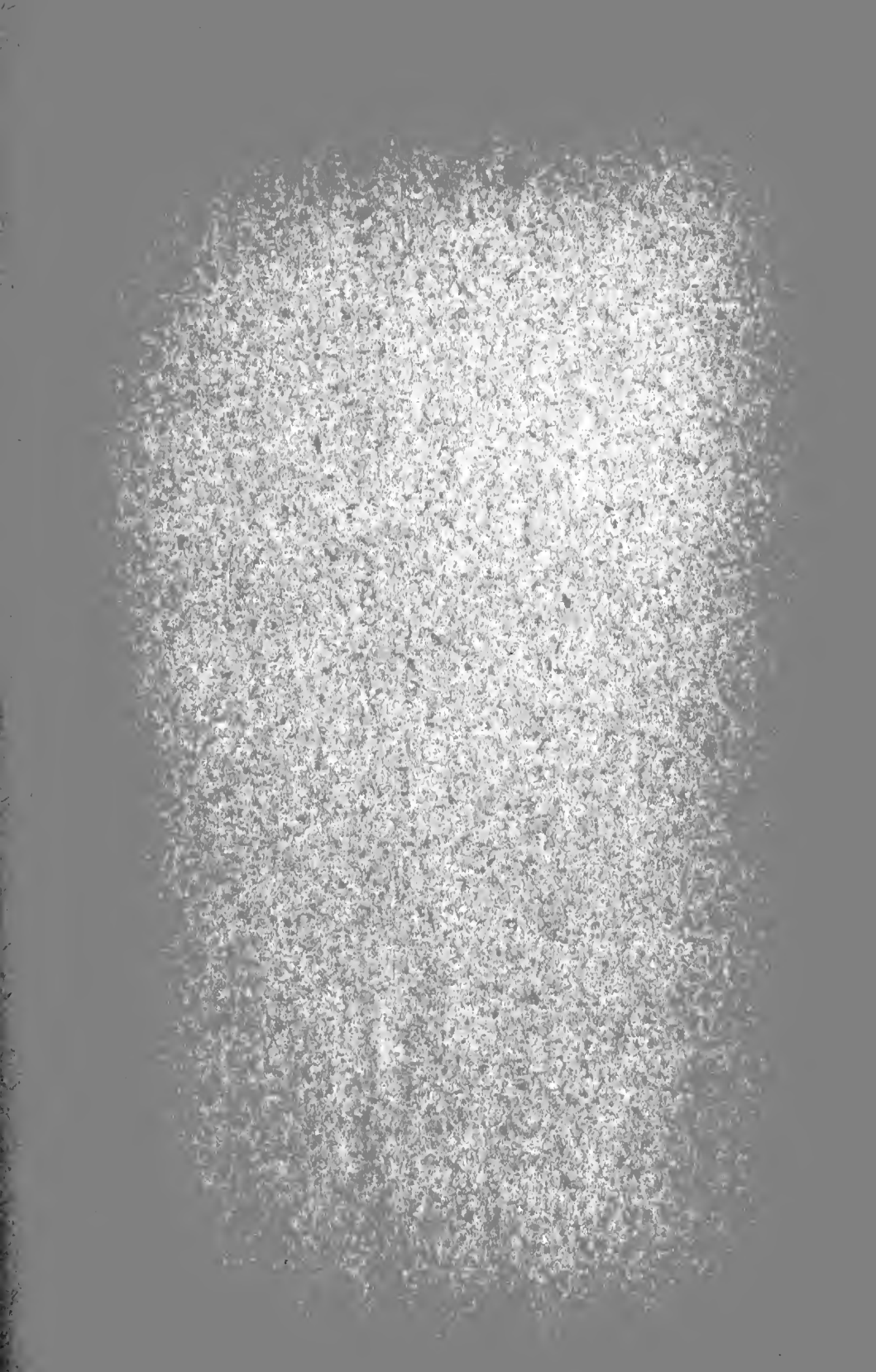
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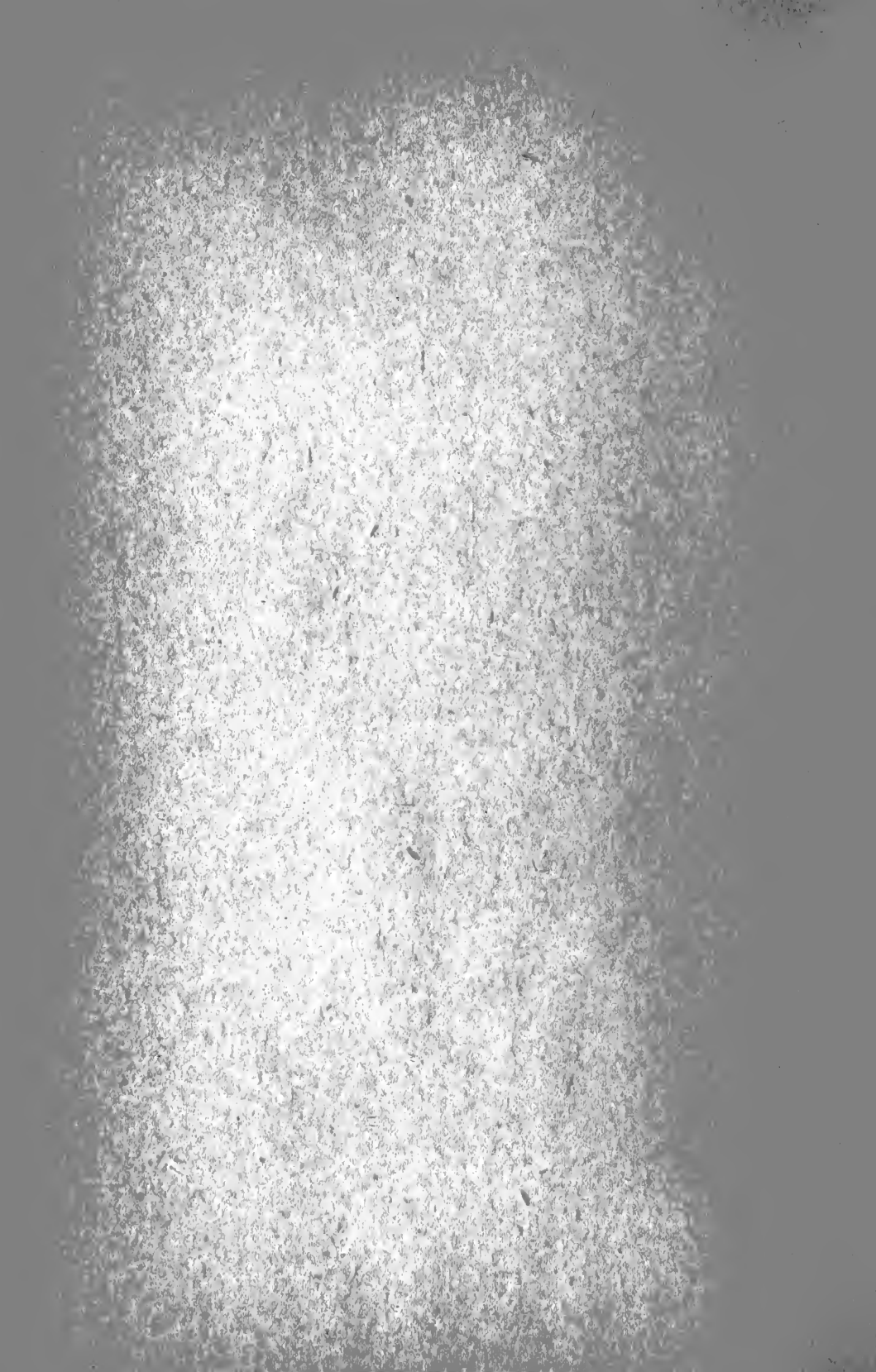




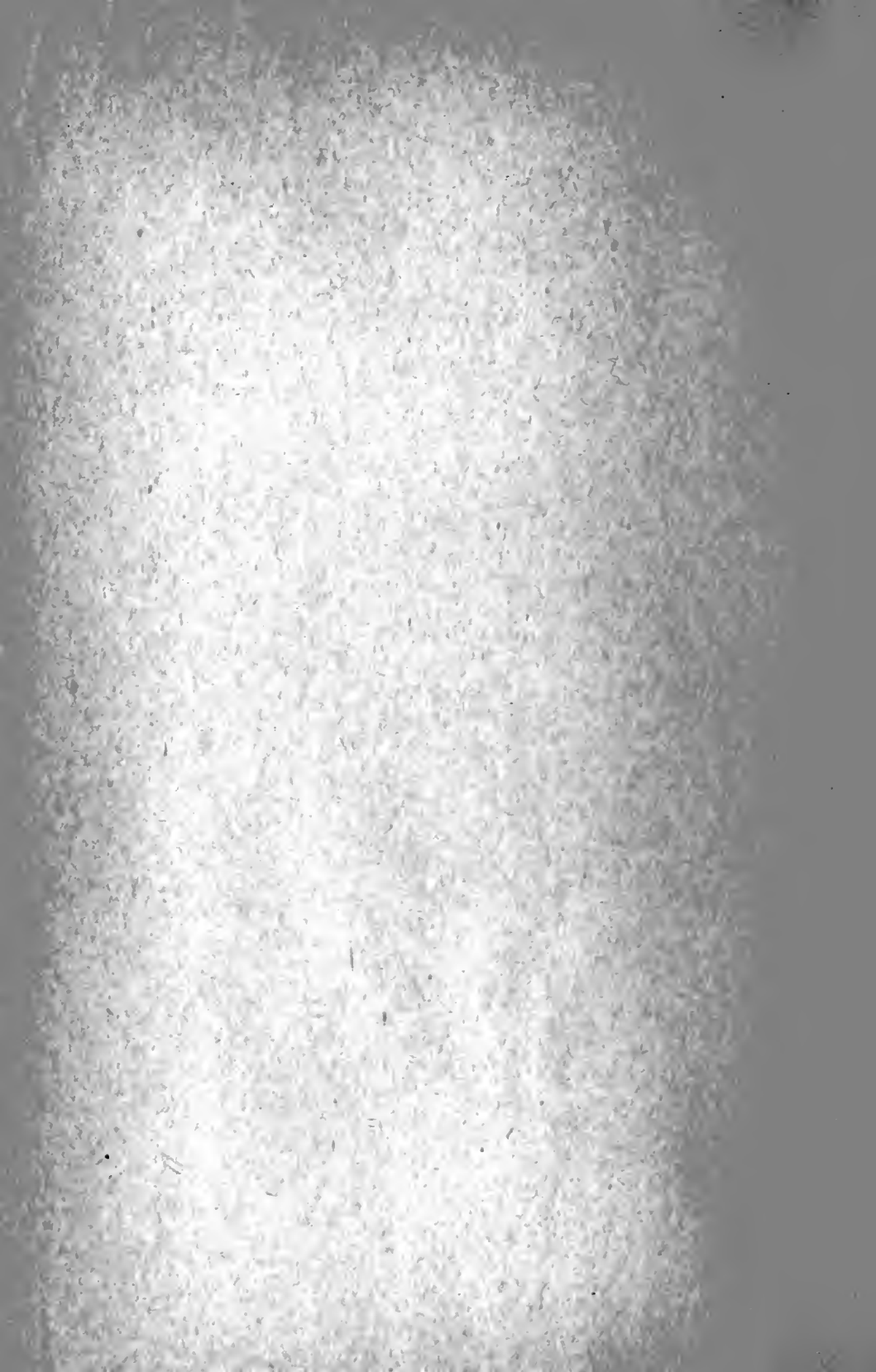












SEVENTEENTH ANNUAL REPORT  
OF THE  
SECRETARY  
OF THE  
STATE BOARD OF HEALTH  
OF THE  
STATE OF MICHIGAN

FOR THE  
FISCAL YEAR ENDING JUNE 30, 1889.

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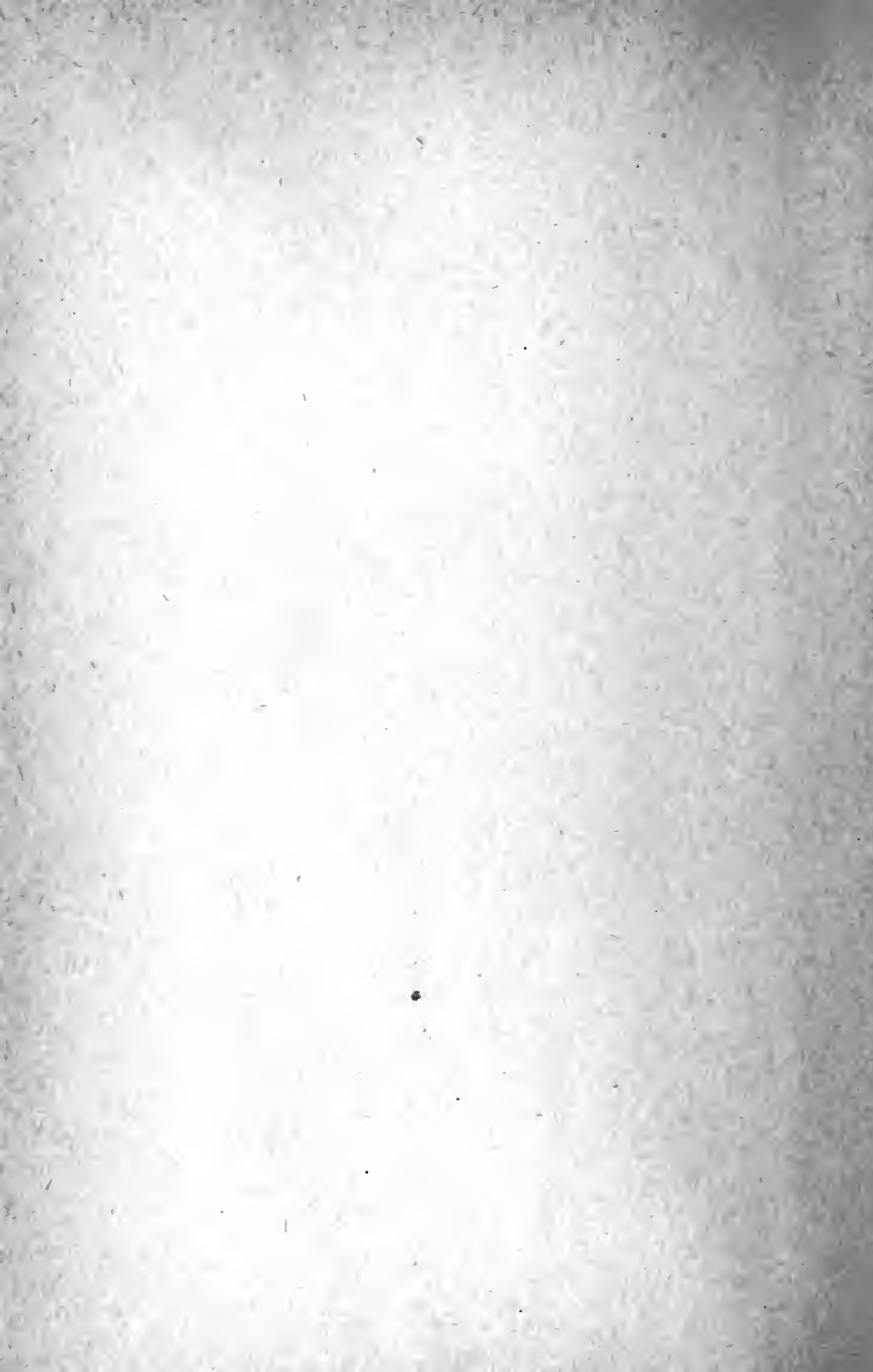


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BY AUTHORITY.

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LANSING, MICH.:  
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1890.



Office of the Secretary of the State Board of Health, }  
LANSING, MICHIGAN, *December, 1889.* }

TO HON CYRUS G. LUCE, *Governor of Michigan:*

SIR:—In compliance with the laws of this State, I present to you the accompanying Report for the fiscal year ending June 30, 1889.

Very respectfully,

HENRY B. BAKER,  
*Secretary of the State Board of Health.*

RESOLUTION OF THE BOARD RELATIVE TO PAPERS PUBLISHED IN ITS  
ANNUAL REPORT.

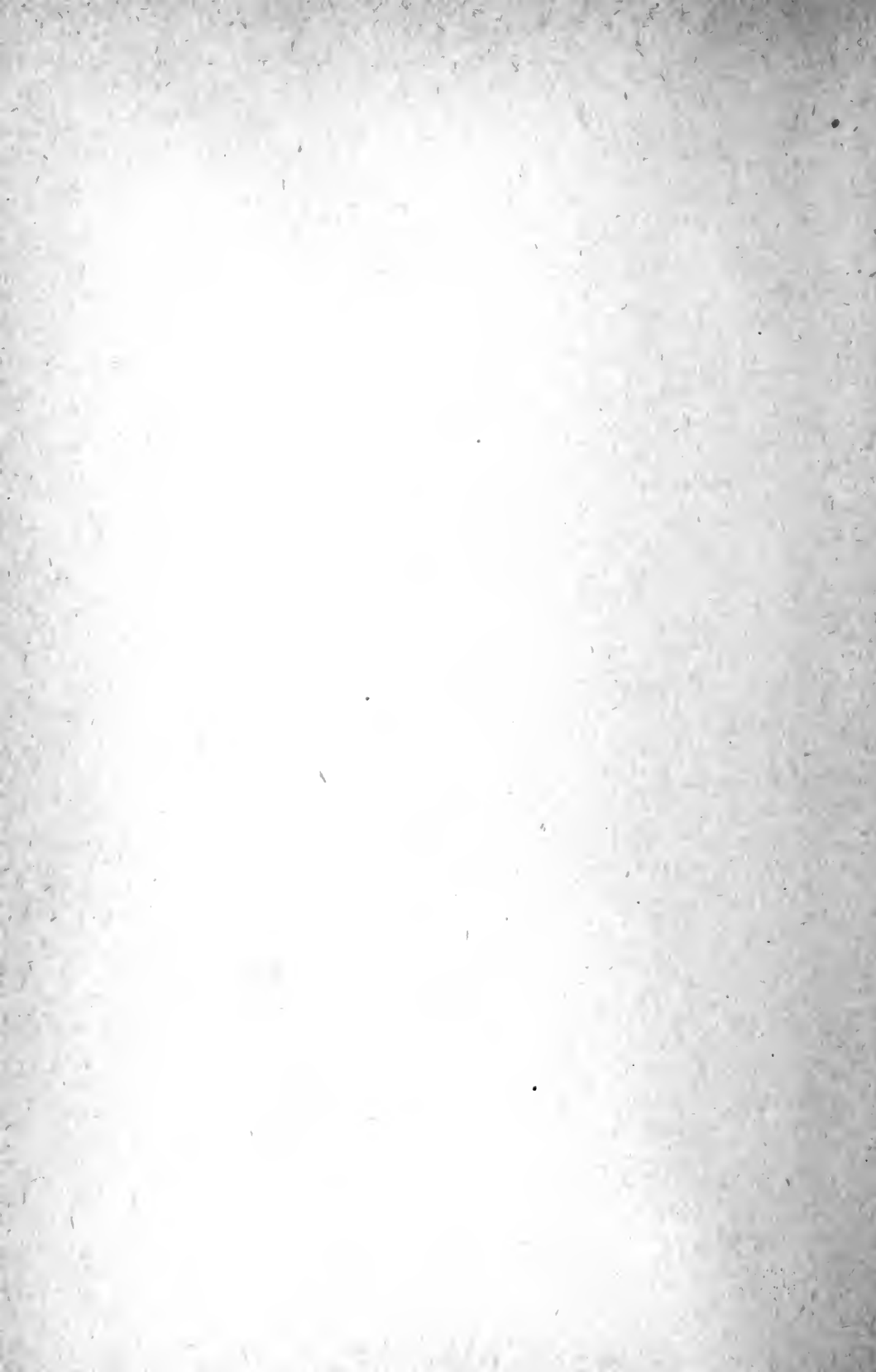
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*Resolved,* That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.



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# REPORT.

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This is the Seventeenth Annual Report of the Secretary of the State Board of Health, and is for the fiscal year ending June 30, 1889. It is arranged and paged in two parts. The first part contains the Secretary's report of work of the Board, the annual report of property, including accessions to the library, with names of donors. The second part contains papers, abstracts, and reports.

Under the law, the Board is authorized to disseminate information "through an Annual Report and otherwise;" and the Board issues immediately after the close of each week a bulletin which shows the sickness during the week just passed. It also issues a monthly bulletin, and publishes quarterly proceedings of the work of the Board and the condition of the health during the quarter. The proceedings of sanitary conventions are published as soon as practicable after the occurrence of each convention.

Thus items of sanitary work in Michigan which are regarded as useful "news" are published at once in the comparatively ephemeral bulletins, etc., while the Annual Report is not issued, as a newspaper or journal is, as an ephemeral publication, but as a permanent official record of the work of the State Board of Health, and of the local boards of health throughout the State. The Annual Report contains also statistics which require a great deal of painstaking care in their preparation, but which it is hoped will be useful, for all time to come, to those who study the causation of diseases; and through their labors, to the people of the State and country; and the statistics are there preserved in a permanent form, accessible, for purposes of study, to a comparatively large number of persons. However, only about six thousand copies of the Annual Report are printed, to supply the two millions and more inhabitants of Michigan; and only 3,500 of those copies are at the disposal of the State Board of Health. Of these, some are sent to libraries, some are sent in exchange for the publications of other State Boards of Health, of prominent city boards of health, of sanitary journals, etc.; others are sent to persons likely to make good use of them, including each of the fifteen hundred health officers in Michigan.

To this Report there are three Supplements, containing proceedings and addresses at the Sanitary Conventions held at Hastings, Otsego and Tecumseh.

The papers are printed subject to a resolution of the Board, printed on page iv.

The names and postoffice addresses of the members of the Board, and the dates of the expiration of their terms of office, are as follows:—

HENRY F. LYSTER, A. M., M. D., Detroit, Jan. 31, 1891.

JOHN H. KELLOGG, M. D., Battle Creek, Jan. 31, 1891.

JOHN AVERY, M. D., *President of the Board*, Greenville, Jan. 31, 1893.

ARTHUR HAZLEWOOD, M. D., Grand Rapids, Jan. 31, 1893.

VICTOR C. VAUGHAN, M. D., Ph. D., Ann Arbor, Jan. 31, 1895.

DELOS FALL, M. S., Albion, Jan. 31, 1895.

HENRY B. BAKER, M. D., *Secretary of the Board*, Lansing.

The members of the State Board of Health, with the exception of the Secretary, are appointed for the term of six years, and receive no salary or *per diem* compensation for their services.

#### STANDING COMMITTEES.

1. Epidemic, Endemic and Contagious Diseases.—H. F. Lyster, M. D.
2. Sewerage and Drainage.—H. F. Lyster, M. D.
3. Food, Drinks and Water-Supply.—V. C. Vaughan, M. D.
4. Buildings, including Ventilation, Heating, etc.—John Avery, M. D.
5. Climate, Geology, Topography, etc.—Henry B. Baker, M. D.
6. Disposal of Excreta.—John H. Kellogg, M. D.
7. Poisons, Explosives, etc.—V. C. Vaughan, M. D.
8. Occupations, Recreations and Habits.—J. H. Kellogg, M. D.
9. Relations of Schools to Health.—Delos Fall, M. S.
10. Sanitary Survey.—Delos Fall, M. S.
11. Vital Statistics.—Henry B. Baker, M. D.
12. Legislation.—John Avery, M. D.
13. Finances of the Board.—Arthur Hazlewood, M. D.
14. Mental Hygiene.—Arthur Hazlewood, M. D.
15. Animal's Diseases Dangerous to Man.—Henry B. Baker, M. D.
16. Relations of Preventable Sickness to Taxation.—J. H. Kellogg, M. D.
17. Plans for Model School Houses.—Hon. John Avery, M. D., J. H. Kellogg, M. D., and Arthur Hazlewood, M. D.
18. Alcoholic Liquors.—Henry F. Lyster, M. D., Victor C. Vaughan, M. D., and Arthur Hazlewood, M. D.

WORK IN THE OFFICE OF THE BOARD DURING THE FISCAL YEAR  
ENDING JUNE 30, 1889.

The work of the office naturally groups itself under three closely related heads,—the collection of information, the compilation and elaboration of information, and the dissemination of information. In the following outline that grouping is adhered to so far as is practicable without repetition.

## COLLECTION AND COMPILATION OF INFORMATION.

## ANNUAL REPORTS BY HEALTH OFFICERS FOR THE YEAR ENDING DEC. 31, 1888.

In December, 1888, a circular (142) which had been approved by the Board, was sent to the health officer of each township, city and village in the State, about 1,500 in all, transmitting a blank form [I] for use in making his annual report to this office. This circular was substantially the same as circular (65), which is printed on pages viii-ix of the report for 1884. Blank form [I], for reports of health officers, is printed in former reports. The circular (142) also transmitted a blank for a copy of the record of diseases dangerous to the public health, similar to the blank which is printed, reduced in size, on page 271 of the report for 1882.

Where the name of the health officer had not been returned to this office, the blanks were sent to the president of the village, the mayor of the city, or the supervisor of the township, according as the vacancy occurred in a village, city or township.

ANNUAL REPORTS BY CLERKS OF LOCAL BOARDS OF HEALTH FOR THE YEAR  
ENDING DEC. 31, 1888.

At the same time (December, 1888) that the circulars and blank forms were sent to the health officers, a circular (143) asking for a report, and a blank form [J] on which to make a report, were sent to the clerk of the local board of health of each township, city and village in the State, about 1,500 in all. A blank form for a copy of his record of cases of diseases dangerous to the public health was also sent; the circular and blank form sent to the clerk were similar to those sent to the health officer, except that they were not so explicit in questions relating to sickness and deaths.

## WEEKLY POSTAL-CARD REPORTS OF DISEASES IN 1888.

The weekly postal-card reports of diseases, sent on cards furnished by the State Board of Health, have been received from health officers of cities and villages and other physicians in different parts of the State. The plan of these weekly card-reports is stated on pages 80 and 81 of this Report; on

page 81 is an example of these reports properly filled out. When a report of a new health officer of a city or village is received, a printed letter is sent (if health officer of a village it is [149], if of a city, a similar letter is sent) with a circular describing the plan of the reports, and transmitting supplies for making them.

A list of observers of diseases for the calendar year 1888 and a compilation of their reports, with a study of relations of sickness to climatic conditions is printed in this Report.

#### HEALTH BULLETINS.

The weekly reports of diseases received up to Wednesday of the week following the week for which they are made, are compiled on that day, week by week, and a bulletin, based on the compilation, is sent for publication to a large number of newspapers, and to sanitary and medical journals. A telegraphic abstract from the compilation is also sent weekly to a Michigan Press Association. A specimen of this weekly health bulletin can be found on page xii of the Report of 1884. Beginning with the month of August, 1884, a monthly health bulletin has been issued immediately after the close of each month, for the use of monthly sanitary and medical journals. A specimen of the monthly bulletin can be found on page ix of the Report for 1885.

#### SPECIAL REPORTS RELATIVE TO DANGEROUS COMMUNICABLE DISEASES.

Every health officer is supplied with blanks "L" from this office, for reporting outbreaks of diphtheria, typhoid fever, scarlet fever, small-pox, measles, etc. (dangerous communicable diseases), to the Secretary of the Board.

Upon the receipt of the report of an outbreak of such disease, blanks "M" for weekly reports during the outbreak, and a blank for a final report at the close of the outbreak are sent, with a circular letter ("Blue Letter"), also a number of documents containing instructions for the suppression of the disease. These are to be distributed to the neighbors of the family in which the disease is, in order to obtain their coöperation with the health officer. About 760 outbreaks of such diseases were thus attended to during the fiscal year ending June 30, 1889.

#### RETURN OF NAMES OF MEDICAL PRACTITIONERS.

About January 1, 1889, blanks for the return of names of Medical Practitioners were sent to each of the clerks of the townships, cities and villages, about 1,500 in number. An example of these blanks is printed on page xi of the Report of the Board for 1888.

## NAMES AND ADDRESSES OF HEALTH OFFICERS OF TOWNSHIPS, CITIES AND VILLAGES.

In April, 1889, the usual demand was made upon supervisors of townships, presidents and clerks of villages, and mayors and clerks of cities, for return of the names and postoffice addresses of health officers. The circular and blank forms used are similar to those printed on pages xiii-xiv of the Report for 1884. In June, 1889, a second demand was sent to localities from which no return had been made in response to the demand in April. In August, 1889, a list of the health officers and of their postoffice addresses was printed, when of the 1,517 townships, villages and cities in the State it was found that all but 249 localities were provided with health officers as the law requires.

Through the systems of reports to the State Board of Health by its corps of correspondents as well as by the local health officers, the Secretary of the State Board often receives information of an outbreak of a communicable disease, and desires to communicate at once with the health officer; but if no health officer has been appointed in that locality, or no return of such appointment has been made, delays occur, and before the Secretary of the State Board can get into correspondence with the delinquent local board and a health officer can be chosen, the disease may spread widely within or without the limits of the village or township, with unnecessary sickness and loss of life.

It should be said that there is an increasing tendency to comply with this law, and local boards now act promptly and coöperate cordially with the State Board of Health in its endeavors to prevent the spread of dangerous communicable diseases.

As fast as addresses of health officers for 1889 were received, a document detailing the duties of health officers was sent to each, together with blanks for the prompt report of dangerous communicable diseases, and sample copies of the documents on the prevention and restriction of diphtheria, scarlet fever and typhoid fever.

## METEOROLOGICAL REPORTS.

A list of meteorological observers for the calander year 1888, with a statement of what registers were received from each, is printed in this Report. The reports are summarized in an article in this Report on the Principal Meteorological Conditions in Michigan in the year 1888. The data are of great value for the purposes of studying the causes of diseases. The observations made at the office of the Board, at Lansing, have been summarized weekly, and a copy kept on file in the office.

## DISSEMINATION OF INFORMATION.

Whenever information is received of the occurrence of diphtheria, scarlet fever, small-pox, or typhoid fever, copies of a document on the restriction and prevention of the disease reported are immediately sent to the health officer, with a request that he distribute them where they will be likely to be read, and it is suggested that the neighbors of those families in which the sickness occurs would be most likely to read them at such times of danger; and it is thought that after reading them they will be most likely to co-operate with the local health officer for the restriction of the diseases. Thousands of pamphlets on each of the most dangerous communicable diseases are distributed by the State Board in this manner—in localities where the disease treated of in the pamphlet is present. They are being distributed in this way all the time, because there is no time when the State is free from scarlet fever or diphtheria, these being among the most important of the dangerous communicable diseases in Michigan. Copies of the documents on diphtheria, scarlet fever, and small-pox, in German or in Dutch, are also sent when it is thought they can be used to advantage. Owing to frequent requests for documents in French, Polish, Swedish, and Danish-Norwegian, translations of a leaflet on contagious diseases [47] have been made into each of these languages; and copies are sent to local boards when so requested.

A record is kept of reports received and of correspondence relative to each outbreak of a dangerous communicable disease of which the office receives information.

During the last part of 1888, a leaflet "Now is a good time to be vaccinated" was prepared, printed and widely circulated where small-pox was present, and throughout the State. This leaflet is printed on pages 276–277 of this Report.

The pamphlet [106] on the Restriction and Prevention of Diphtheria was revised and 10,000 copies printed in January, 1889. These are sent to health officers and others in localities of outbreaks of diphtheria, to be distributed among the people while the disease threatens, by its presence.

A pamphlet [120] "Work of Health Officers and Local Boards of Health" was revised and about 3,000 printed. These are distributed to health officers and members of local boards of health, and to other persons who may need to know the duties of such officers, and the laws relative thereto.

The names and addresses of 1,262 health officers in Michigan were printed, and a copy of the pamphlet sent to each health officer in Michigan, in order to facilitate his ready notification, to the health officer of any locality in



this State, concerning the possible spread of any dangerous communicable disease; also to facilitate correspondence on any of the numerous questions with which health officers have to deal. The pamphlet was also sent to each of the 249 delinquent boards of health, in the hope that, on seeing the blank where there should be the name of a health officer, they would then comply with the law which requires the appointment of a health officer and the return of his name. In some instances that was the result. The pamphlet has also been useful, in the Office of the Secretary of the State Board, for several other purposes.

Two diagrams, "Isolation and Disinfection Restrict Diphtheria," and "Isolation and Disinfection Restrict Scarlet Fever," have been prepared, and many hundreds of them distributed. These diagrams are printed on pages 212 and 231 of this Report. They exhibit, in a condensed form, the experience of the health officers in Michigan, in 1888, with these two important diseases.

Abstracts and brief accounts of the proceedings at meetings of the State Board of Health are prepared, printed, and distributed soon after the regular meetings of the Board. (Extracts from these abstracts are printed on pages following, in this Report.) The distribution of the pamphlet Proceedings is not the same for all meetings, being to different classes of persons, according to the nature of the contents, in some instances being sent to teachers and school officers, in other instances to health officers, etc.

Reprints, of articles in the Report and in Proceedings of Sanitary Conventions, have been made, in pamphlet form, and sent in answer to queries, in letters, that can best be answered in that manner. For example, many reprints of the article relative to alleged nuisances, in the preceding year, have been thus sent out, in response to questions.

## REPORT OF THE SECRETARY RELATIVE TO PROPERTY, ETC., FOR THE FISCAL YEAR (NINE MONTHS) ENDING JUNE 30, 1889.

### *To the President and Members of the Michigan State Board of Health:*

GENTLEMEN:—In compliance with Section 5 of Article II. of the by-laws of this Board, the following report of the "Nature and amount of property belonging to the board, which has been received," issued, expended and destroyed since the last report, and of the property remaining on hand, and also in whose care each item of property is intrusted," is respectfully submitted:

My last report is printed on pages xvii-xxix, of the Annual Report for the year 1888.

#### INSTRUMENTS PURCHASED SINCE LAST REPORT.

Meteorological instruments have been purchased during the fiscal year ending June, 30, 1889, as follows:—

- 3 Maximum registering thermometers, without supports.
- 3 Minimum registering thermometers, without supports.

## METEOROLOGICAL INSTRUMENTS.

Meteorological instruments have been entrusted to observers during the fiscal year ending June 30, 1889, as follows:—

- One standard thermometer to W. C. Haines, Lansing.
- One dry bulb thermometer to E. H. McCallum, Lansing.
- One maximum registering thermometer and one barometer No. 2583 (to replace barometer No. 2199 which was returned by Dr. Kellogg with broken tube) to J. H. Kellogg, M. D., Battle Creek.
- One raingauge, transferred by M. P. Brown, Tecumseh, to Abner Wilson, Tecumseh.
- One dry bulb thermometer with board and clips; one wet bulb thermometer with cup and wick; one minimum thermometer with board and clips; one maximum thermometer with screw-bolt and pin; one barometer with hook, and one barometer box; one raingauge, with tube to catch overflow; one measuring stick, all transferred by M. P. Brown, Tecumseh, to C. E. Beers, Tecumseh.
- One maximum and one minimum registering thermometer, placed in shelter for instruments, at the office of the State Board of Health, those formerly in use having become disabled by rust, etc.
- One minimum registering thermometer to Lieut. A. H. Boies, Hudson.
- One barometer, No. 2583, with hook and box; one dry bulb thermometer, with board and clips; one wet bulb thermometer, with cup and wick; one raingauge, with tube to catch overflow; one measuring stick for raingauge; one maximum registering thermometer, with screw-bolt and pin; one minimum registering thermometer with board and clips (the maximum thermometer was returned, broken, to this office, May 26, 1890, and another sent to replace it, May 8, 1890,) to Prof. J. W. Ewing, Alma.
- One barometer, with hook and box; one maximum registering thermometer, with screw-bolt and pin; one minimum registering thermometer with board and clips; one dry bulb thermometer, with board and clips; one wet bulb thermometer, with cup and wick; one raingauge, with tube to catch overflow; one measuring stick for raingauge, all transferred by W. T. Drake, Marshall, to George H. Greene, M. D., Marshall. The minimum thermometer, No. 5171, was broken by Dr. Greene, while cleaning it, and another, No. 6872, was sent to replace it Feb. 25, 1889. The minimum thermometer, No. 6872, was broken, in transit, by the express company, and another, No. 5173, was sent to Dr. Greene to replace it, Feb. 27, 1889.
- One barometer with hook and box; one dry bulb thermometer, with board and clips; one wet bulb thermometer, with cup and wick; one maximum registering thermometer, with screw-bolt and pin; one minimum registering thermometer, with board and clips; one raingauge, with tube to catch overflow; one measuring stick for raingauge, to Prof. Chas. E. Barr, Albion.
- Meteorological instruments remaining on hand June 30, 1889:—
- Ten dry bulb thermometers. (Including those in use in shelter for instruments.)
- Ten wet bulb thermometers. (Including those in use in shelter for instruments.)
- One psychrometer complete. (In Secretary's room.)
- One dry bulb thermometer, disabled with long use.
- Four maximum thermometers. (Including those in use in instrument shelter.)
- Four minimum thermometers. (Including those in use in instrument shelter.)
- One minimum thermometer. (Imperfect, needle sticks in tube.)
- One standard instrument for testing illuminating oils.
- One long oil-testing thermometer.
- Six registering thermometer boards. (Including the one in use in shelter for instruments.)
- Nine psychrometer boards. (Including the one in use in shelter for instruments.)
- Thirty-seven thermometer clips. (Including those in use in shelter for instruments.)
- Part of a ball of lamp wicking.
- Two measuring sticks for raingauge. (Including one in use in Office State Board of Health.)
- Two psychrometer cups. (Including the one in use in instrument shelter.)
- Four psychrometer cups, spoiled from rust and long exposure.
- One anemometer complete. In use at Office State Board of Health.
- Three barometers. (Including the one in use in Office, State Board of Health.)
- Seven screw bolts for registering thermometers. (Including the one in shelter for instruments.)
- Nine pins for registering thermometer. (Including the one in shelter for instruments.)
- Four raingauges. (Including the one in use at Office State Board of Health.)
- One raingauge, leaky.
- Five barometer boxes. (Including the one in use in Office State Board of Health.)
- Part of a skein of psychrometer wick.

Sixteen broken thermometers.—Accidentally, by observers, since the Board has been established.  
One worn-out anemometer spindle.  
Three caps for raingauges.

ACCESSIONS TO THE LIBRARY.

Books and other publications have been received and placed in the library of the Board (during the fiscal year ending June 30, 1889), as follows:—

BY GIFT, EXCHANGE, ETC. (*Names and addresses of donors being printed in italics*).—

- Abbott, Sam'l W., M. D., Boston, Mass.*:—  
Hydrophobia.  
Forty-sixth Registration Report of Massachusetts, for the year ending December 31, 1887.  
Report of the State B'd of Health upon the Sewerage of the Mystic and Charles River Valleys, Jan. 1889.  
*Adams, Franklin G., Topeka, Kansas*:—  
Sixth Biennial Rep. of the B'd of Directors of the Kansas State Hist. Soc., for the Period Jan. 19, 1887—Nov. 20, 1888.  
*Ainger, D. B., Lansing, Mich.*:—  
Report of the Adjutant General of the State of Michigan for the years 1887-1888.  
*Allen, C. L., M. D., Rutland, Vt.*:—  
First Ann. Rep. of the Sec'y of the State B'd of Health of Vt. for the year ending Sept. 1, 1887.  
First Ann. Rep. of Sec'y of State B'd of Health of Vermont, year ending Sept. 1, 1887.  
Filtration and Purification of water, etc.  
Second Ann. Rep. of the Sec'y of the State B'd of Health of Vermont, year ending Sept. 1, 1888.  
*American Meteorological Journal, Ann Arbor*:—  
Circular concerning Prizes for Tornado Studies.  
*American Statistical Association, Boston, Mass.*:—  
Publications of the Am. Statistical Assoc.  
*Aplin, H. H., Lansing, Mich.*:—  
Ann. Rep. of the Auditor Gen. of the State of Mich. for the Fiscal year ending Dec. 31, 1888.  
*Ashford, Clarence W., Honolulu*:—  
Report of Special Com. to visit Kakaako Leper Settlement.  
Biennial Rep. of Pres. of the B'd of Health to the Legislature of Hawaiian Kingdom.  
*Ashman, G. C., M. D., Cleveland, O.*:—  
Sixteenth Ann. Rep. of the Health Dept. of the City of Cleveland, year ending Dec. 31, 1888.  
*Bailey, Steele, M. D., Stanford, Ky.*:—  
Minutes of the Thirty-third Ann. Meet'g of the Kentucky State Med. Soc., held at Crab Orchard Springs, July 11, 12 and 13, 1888.  
*Baker, Henry B., M. D., Lansing, Mich.*:—  
Recent Advances in State Medicine.  
Malaria, and the Causation of Periodic Fever.  
Tables and Diagrams to accompany, "The Climatic Causation of Consumption."  
*Baker, N. D., M. D., Martinsburg, W. Va.*:—  
Biennial Report of the State B'd of Health of West Virginia, for the years 1887 and 1888.  
*Balch, Lewis, M. D., Albany, N. Y.*:—  
An Act for the preservation of Public Health, etc., N. Y.  
Report on School Hygiene.  
Eight Ann. Rep. of New York State B'd of Health, 1887.  
*Rep. of Willis G. Tucker, M. D., Ph. D., Analyst of Drugs.*  
Rules and Regulations of the State B'd of Health for the Destruction of Animals affected with Glanders.  
*Ballot, Buys, Prof., Utrecht, Netherlands*:—  
Verdeeling Der Warmte Over de Aarde.  
*Becker, Dr. K., Berlin, Germany*:—  
Statistisches Jahrbuch für das Deutsche Reich, Neunter Jahrgang, 1888.  
Monatshefte zur Statistik des Deutschen Reichs, Jahrgang, 1888, Juni Heft.  
Monatshefte zur Statistik des Deutschen Reichs, Jahrgang, 1888, September Heft.  
Monatshefte zur Statistik des Deutschen Reichs, Jahrgang, 1889, Januar Heft.  
Monatshefte zur Statistik des Deutschen Reichs, Jahrgang, 1889, Februar Heft.  
*Berner, H., M. D., Christiania*:—  
Statistiske Hygienique de la ville de Christiania.  
*Bidenkap, Stadsphysikus, Christiania*:—  
Beretning om Folkemaengden og Sundhedstilstanden i Christiania i Aaret, 1887.  
*Billings, John S., M. D., L. L. D.*:—  
Forms of Tablos of Vital Statistics.  
*Board of Health of the City of San Francisco*:—  
Ann. Rep. of the Health Dept. of the City and County of San Francisco.  
*Board of State Charities of Rhode Island, Providence, R. I.*:—  
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## ACCESSIONS BY EXCHANGE.

*Received in exchange for Publications of this Board the following Periodicals (in some instances incomplete volumes) :—*

Agricultural College Bulletin, Lansing, Mich.

Alabama Weather Service.

American Analyst, New York.

American Inventor, Cincinnati.

American Exchange and Review, Philadelphia.

American Monthly Microscopical Journal, New York.

American Grocer, New York.

American Pharmacist.

American Practitioner and News, Louisville.

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Bulletin Hebdomadaire de Statistique Demographique et Médicale, Havre.

Bulletin Mensuel du Bureau de Demographie, Marseilles.

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Therapeutic Gazette, Detroit.

Vaccination Inquirer, London.	Weather and Crop Bulletin, Washington, D. C.
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Veröffentlich. des Statistischen Amts der Stadt, Berlin.	Weekly, Medical Review, Chicago. Weekly Return of Births and Deaths in Dublin.

### LOANS FROM THE LIBRARY.

Publications drawn out, and not yet returned to the library are as follows:

BY HOMER O. HITCHCOCK, M. D.

Memoirs of Diphtheria, Library No. 716.  
Prevention of Cholera Infantum and kindred disorders, No. 1528.

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xxviii STATE BOARD OF HEALTH.—REPORT OF SECRETARY, 1889.

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Curative Effect of Baths, No. 131.  
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BY DR. H. A. BARBER.

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Food, its Adulterations, etc., No. 655.  
Foods.—Smith.—No. 99.  
Proceedings Nat. Pure Food Convention, 1887, No. 6464.  
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Foster's Physiology.—Reichert.—No. 5608.  
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# SECRETARY'S REPORT OF PROPERTY.

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BY DR. T. B. GALBRAITH.

Monthly Bulletin, Ia., July, 1888.

Mich. State Pharmac. Assoc. Sixth Ann. Meeting, 1888.

BY JUDGE J. B. MCMAHON.

Proceedings of the Royal Society of Edinburgh, 1887-8, No. 6753.

The following table shows the amount and kind of hard paper there was on hand at the time of making the last report, the amount purchased during the year, the amount used, and the amount now on hand :—

Kind of Paper.	On hand at last Report.		Purchased Since Last Report.		Used during the Year.		On Hand Now.	
	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.
Flat .....	5	325	-----	-----	2	281	3	44
Crown.....	8	-----	8	-----	9	220	6	260
Folio Post.....	16	164	35	-----	21	439	29	205
Demy.....	8	73	-----	-----	-----	180	7	373
Medium.....	1	214	-----	-----	-----	9	1	205
Byron Weston.....	-----	356	-----	-----	-----	6	-----	350
Foolscap.....	1	360	-----	-----	-----	-----	1	360
Legal cap.....	2	50	-----	-----	-----	50	2	-----
Blotting paper.....	-----	175	-----	-----	-----	35	-----	140
Blue cover paper.....	2	471	12	-----	2	195	12	276
Postoffice paper.....	1	300	-----	-----	-----	50	1	250
Book paper.....	-----	108	-----	-----	-----	108	-----	-----
Manilla wrapping paper.....	3	348	-----	-----	2	216	1	132

The hard paper has been used for making blank books for use in office, circulars, announcements and programs for sanitary conventions, printed letters, writing paper, etc. The cover paper has been used for covers to reprints, supplements, and record books for weekly reports of diseases, and wrappers for packages of ozone test paper.

There are now on hand 4,656 sheets of hard paper of half letter size, 200 sheets of note paper, and 560 sheets of one-half note size.

There were about 118,671 envelopes on hand at the time of making the last report; 47,000 of the various kinds used in the office have been purchased since, making a total of 165,671. There are on hand now of printed envelopes 47,311; of blank envelopes \$1,836; making a total of 129,147. About 36,524 have been used in the work of the office.

There was on hand at the time of making the last report \$28.51 in postage stamps, postal cards and postal money. Vouchers for postage (for use in the office) have been allowed during year to the amount of \$1,376.00. There is now on hand in postal money \$20.76. The cost of postage during the nine months has been \$1,333.75, as follows :—

Distribution of Annual reports.....	\$672 12
General distribution of documents and circulars.....	204 86
Sending weekly and monthly bulletins.....	27 35
Collection and dissemination of statistics and information in regard to communicable and other diseases.....	60 59
Sending announcements and programs for sanitary conventions.....	62 18
Sending meteorological material to observers.....	7 51
Regular and special correspondence of the office, and all other postage (including a considerable amount for distribution of documents on the restriction of diphtheria, scarlet fever, and typhoid fever, in localities where those diseases occurred).....	349 14
Total.....	\$1,383 75

TOTAL AMOUNT AND CLASSIFICATION OF EXPENDITURES BY THE STATE  
BOARD OF HEALTH, AS PER VOUCHERS 1596-1740 INCLUSIVE  
(EXCEPT NUMBER 1598), ALLOWED DURING THE  
FISCAL YEAR ENDING JUNE 30, 1889.

Chemical Analyses.....	\$20 00
Engraving, drawing, etc.....	1 50
Expenses of members :—	
Attending meetings.....	103 90
Other official.....	420 16
Instruments and books.....	398 65
Paper, stationery, etc.....	581 76
Postage :—	
Office.....	1,376 00
Members.....	—
Printing and binding.....	726 92
Secretary.....	2,500 00
Special Investigations.....	50 00
Miscellaneous.....	396 04
Total.....	<u>\$6,574 93</u>

Respectfully submitted,

HENRY B. BAKER,  
*Secretary.*

Having examined the Secretary's annual report of property received, issued and expended during the year ending June 30, 1889, and having compared the foregoing account of expenditures for the fiscal year ending June 30, 1889, with the books in the Auditor General's office, I find the same to be correct.

ARTHUR HAZLEWOOD,  
*Committee on Finances of the Board.*

Lansing, Mich.

## EXPENDITURES BY THE STATE BOARD OF HEALTH IN THE CALENDAR YEAR, 1888.

The foregoing is reported, in compliance with law, relative to the fiscal year. But the appropriations for the Board are for the calendar year, and they amount to six thousand dollars. The expenditures for any calendar year, therefore, cannot exceed six thousand dollars. The following is a classified statement of expenditures for the calendar year 1888.

## CLASSIFIED STATEMENT OF EXPENDITURES BY THE BOARD DURING THE CALENDAR YEAR 1888.

Chemical Analyses.....	\$20 00
Engraving, drawing, etc.....	1 50
Expenses of members :—	
Attending meetings.....	104 94
Other official.....	418 05
Instruments and books.....	355 61
Paper, stationery, etc.....	525 88
Postage :—	
Office.....	867 00
Members.....	75
Printing and binding.....	789 82

Secretary .....	\$2,500 00
Special investigations.....	62 86
Miscellaneous.....	346 16
Total.....	\$5,992 57

## EXPENDITURES ON ACCOUNT OF THE BOARD.

The appropriations (\$8,000) at the disposal of the State Board of Health are for certain specified purposes, not including clerk hire, the publication of the annual report, or the expenses in the examinations of plans for public buildings; these expenditures *on account of* but not by the board are provided for by other acts of the legislature than those appropriating money to be expended by the board, and the accounts are kept in other offices, not in the office of the Board of Health: the accounts for clerk hire are kept by the Auditor General, and reported in his Annual Report; the accounts for publication of the annual reports, and for expenses in the examinations of plans for public buildings, are kept by the Board of State Auditors, and are published in the Annual Report of that Board.

Respectfully submitted,

HENRY B. BAKER,  
Secretary.

## ABSTRACTS AND BRIEF ACCOUNTS OF THE PROCEEDINGS AT MEETINGS OF THE STATE BOARD OF HEALTH DURING THE FISCAL YEAR, ENDING JUNE 30, 1889.

### REGULAR QUARTERLY MEETING, JULY 10, 1888.

Members present:—Hon. John Avery, M. D., President; Hon. C. V. Tyler, M. D.; Arthur Hazlewood, M. D.; and Henry B. Baker, M. D., Secretary.

### PROPOSED HEALTH LEGISLATION.

Besides the routine business, certain proposed bills for perfecting the Public Health Laws of the State were discussed at the morning session and referred to the Committee on Legislation. The objects of the bills are as follows:—

1. A Bill to prevent the use and sale of infected milk and infected milk products;
2. A Bill to declare the least proportion of milk solids and of fat in unadulterated milk;
3. A Bill to require the labeling of all gasoline, benzine and naphtha sold at retail; and
4. A Bill to prevent the introduction and spread of dangerous communicable diseases.

Relative to Bill No. 2, mentioned above, it may be said that a law in Michigan prohibits the sale of impure or adulterated milk (Act No. 246, Laws of 1887), and provides for an inspection of milk in Detroit and other cities and incorporated villages in the State. This law provides penalties for its violation, but it does not fully explain what is meant by pure milk. In each prosecution it is necessary to go over the whole ground of proving

what should be taken as a standard, and why. If an unscrupulous chemist appears for the defense, and gives it as his opinion that the standard is too high, the offending milkman may escape because of this conflict of testimony. If the law fixed a definite legal standard, such a result would not be possible. The thousands of analyses made and recorded in the different States of the Union supply a basis for fixing such a legal standard. In drawing the bill presented to the Board at this meeting, the Secretary has corresponded with chemists and milk inspectors in other States, and the bill is drawn in accordance with the best information which he was able to obtain.

The object of Bill No. 4, mentioned above, is to punish any one who, knowingly affected with small-pox, scarlet fever, diphtheria, or any other dangerous communicable disease, shall willfully enter a public place or a public conveyance, or who shall willfully go into any other locality without a permit of the Board of Health of that locality, or who shall knowingly and willfully convey any child or irresponsible person affected with any dangerous communicable disease, or the corpse of a person dead from such disease, or who shall, in any way, subject another to danger of contracting one of these diseases. At present there is no statutory provision punishing those traveling from place to place on the cars or in other public conveyance, knowing themselves to be affected with a dangerous communicable disease, and cases have been brought to the notice of the State Board of Health, which would be covered by this proposed bill.

A letter was presented from a citizen of Branch county complaining that incompetent practitioners were driven, by the stringent laws of Indiana and other States, into the southern counties of Michigan, and asking the State Board of Health to exert its influence to protect the State from charlatans and quacks. The subject was discussed by the Board and referred to a committee with instructions to draft a proposed bill for presentation to the legislature.

#### DIETARY OF STATE INSTITUTIONS.

The Secretary stated that replies had been received from seven different State Institutions in reply to the request made by the State Board of Health for information concerning dietary, as follows:—Michigan State Prison, Michigan School for the Deaf, Detroit House of Correction, Michigan State Public School, State Industrial Home for Girls, Michigan State Reform School, and the Eastern Asylum for the Insane. These replies were read at the meeting of the Board, and were referred to Dr. Hazlewood for further careful study and report.

#### POISONING BY TYROTOXICON.

A communication was read from Dr. Wm. C. West, of Monroe, Michigan, concerning about twenty cases of cheese poisoning in that city. Those poisoned "were taken at first with great prostration—a sensation as though they would die. This was followed by vomiting, which would relieve them somewhat. The vomiting was very severe in most of the cases. The vomiting was followed by diarrhea. There was pain in the stomach and bowels." All who ate of the cheese were affected.

A sample of the cheese was sent to Professor R. C. Kedzie for analysis, and the following reply was received:—

## MICHIGAN AGRICULTURAL COLLEGE.

DEPARTMENT OF CHEMISTRY,  
Ingham Co., Mich., June 20, 1885. }

DR. H. B. BAKER, *Sec. State Board of Health*:

DEAR DOCTOR:—The specimen of cheese you sent me for examination on the 16th inst. has been carefully tested for tyrotoxicon. I find the poison present in very distinct quantity. I have separated the poison in needle-shaped crystals, usually associated in stellar form. The reactions with ferrocyanide of potassium and ferric chloride, also with iodic acid and starch are very distinctly given.

I did not try the poison on the animal system, but have no question that the cheese contains tyrotoxicon, and that its poisonous effect is to be ascribed to that substance.

Very truly yours,

R. C. KEDZIE.

## HEALTH OFFICERS SHOULD ACT ON DIAGNOSIS OF RELIABLE PHYSICIAN.

Complaints reach the State Board that some health officers use their official position to injure brother practitioners who report dangerous communicable diseases, by going to a case after the prominent symptoms have disappeared, deciding that it is not the disease reported, and thus bringing upon the physician who reported it the contempt of the family. After considerable discussion, the following resolution was adopted:

*Resolved*, That it is the opinion of this State Board that when a case of a dangerous communicable disease is reported by a reliable physician, the health officer should act upon the diagnosis of such physician without question.

## COMPENSATION OF HEALTH OFFICERS.

Dr. Hazlewood's report on the replies received concerning the compensation of health officers in Michigan was presented at this meeting and ordered printed in the annual report. [It is printed on pages 159-163 of this Report.]

## EXAMINATION OF PLANS FOR A PROPOSED STATE BUILDING.

The plans for a proposed cottage for convalescent insane near the asylum at Kalamazoo were examined at considerable length, but not very satisfactory results could be reached because of lack of statement of details. Letters explanatory by the Medical Superintendent, Dr. Palmer, were read by the Secretary, and these letters gave more information than did the plans themselves.

The proposed cottage was to accommodate fifty inmates. The plans and letters showed that considerable attention had been given to some of the sanitary requirements. However there were no plans or specifications indicating the nature of the plumbing or house-drainage; there was no explanation of the construction or intended uses of the basement. The plans showed no ventilation of the water-closets; but a letter referred to a ventilating pipe from each. The details of the plans were not shown with such definiteness as would enable the Board to express an opinion on many of the points of proposed construction. This was regretted, especially as faulty

construction and management of ventilation and house-drainage had recently been alleged to have caused serious outbreaks of preventable disease, and deaths, in two State institutions in Michigan. The sizes of fresh-air inlets were stated in a letter to be four by twelve inches, and the foul-air outlets, four by six inches. The Board suggested that they be larger, and specified the area of such inlets and outlets recommended for some of the rooms.

#### REGULAR MEETING, OCT. 23, 1883.

Members present:—Hon. John Avery, M. D., President; Prof. Henry F. Lyster, M. D.; Prof. Victor C. Vaughan, M. D.; J. H. Kellogg, M. D.; and Henry B. Baker, M. D., Secretary.

At the morning session, besides a large amount of routine business, such as the examination and auditing of bills and accounts, Dr. Kellogg read a perfected report of his investigations of the outbreak of typhoid fever at the State Industrial Home for Girls at Adrian, which report was ordered printed in the Annual Report.

#### TRANSPORTATION OF DEAD BODIES.

At the afternoon session, Dr. Baker presented a communication from the Secretary of the National Association of General Baggage Agents, giving the rules proposed by that Association for the guidance of railroad and transportation companies in the transporting of dead bodies. These rules were submitted to the State Board of Health with the statement that "it is not assumed that they are now perfect and that we are simply asking your approval of them, on the contrary, we solicit any suggestions or recommendations which, in your opinion, will be in the interest of public health, and at the same time not unnecessarily burdensome and expensive to the public." These proposed rules are as follows:—

1. The transportation of the bodies of persons dead of Small-Pox, Asiatic Cholera, Typhus Fever, or Yellow Fever is absolutely forbidden.

2. The bodies of those who have died of Diphtheria, Scarlet Fever, Typhoid Fever, Erysipelas, Measles, and other contagious, infectious, or communicable diseases, must be wrapped in a sheet thoroughly saturated with a strong solution of chloride of zinc, in the proportion of one-half pound of chloride of zinc to a gallon of water; or a strong solution of not less than two per cent. of the bi-chloride of mercury, and encased in an air-tight zinc, copper or lead lined coffin, or in an air-tight iron casket, and all enclosed in a strong, tight wooden box. The coffin or casket must also be surrounded in space between coffin and outside box by sawdust saturated with a solution of chloride of zinc, or bi-chloride of mercury of same strength as above.

3. In cases of contagious, infectious, or communicable diseases, the body must not be accompanied by persons who, or articles which have been exposed to the infection of the disease. And in addition to permit from Board of Health, agents will require an affidavit from the shipping undertaker, stating how body has been prepared, and kind of coffin or casket used, which must be in conformity with rule 2, and that the health officer of the locality to which the body is consigned, has consented to the proposed shipment, and has had such timely notice of the hour of its arrival within his jurisdiction as will enable him to supervise its reception.

4. The bodies of persons dead of diseases that are not contagious, infectious, or communicable may be received for transportation to local points in same state; when encased in a sound coffin or metallic case, and enclosed in a strong wooden box securely fastened so it may be safely handled. But when it is proposed to transport them out of the same state, or to another state, they must be encased in an air-tight zinc, copper, or lead lined coffin, or in an air-tight iron casket. If any other kind of coffin is used, the body must be properly embalmed.

5. Every dead body must be accompanied by a person in charge, who must be provided with a ticket, and also present a full first class ticket marked "Corpse" and a permit from Board of Health, giving permission for the removal, and showing name of deceased, cause of death, and whether of a contagious or infectious nature.

6. The permit from Board of Health must be issued in duplicate, the original to accompany body to destination, the duplicate copy will be retained by agent at initial point, and sent to the General Baggage Agent.

7. It is intended that no dead body shall be removed which may be the means of spreading disease, therefore, all disinterred bodies, dead from any disease or cause, will be treated as infectious and dangerous to public health, and will not be accepted for transportation unless said removal has been approved by the State Board of Health, and the consent of the health officer of the locality to which the corpse is consigned, has first been obtained.

The Board recommended that rule 2 above be amended so as to include puerperal fever; and that the recommendation to saturate the sheet and sawdust with chloride of zinc be stricken out, for the reason that the zinc solution mentioned is not strong enough to be certainly effective, and one method was preferable to two because more certain to be understood and fulfilled.

In rule 4 the Board recommended that for the words "out of the same state, or to another State," there be substituted the words "for a considerable distance," or a specified distance.

With these changes, the Board approved of the foregoing proposed rules.

[While this Board has here for the first time recommended or at least, by omitting to strike it out of rule 2, has countenanced the use of the bichloride of mercury (corrosive sublimate) as a disinfectant, it should be understood by everyone who has to do with this exceedingly dangerous substance that its great value as a disinfectant depends upon its deadly effects upon living things. The common people have long used this same deadly solution (corrosive sublimate) for the destruction of household pests, but its use has been attended with danger and lives have been lost. Inasmuch as such deadly agents seem to be required for the most complete disinfection, the details should always be attended to by persons familiar with their properties, and who realize the necessity for extreme care in handling, storing, and using so dangerous a poison as is corrosive sublimate. Henry B. Baker, Secretary, State Board of Health.]

In addition to the foregoing rules, the Board adopted the following:

*Precautions in exhuming bodies dead from dangerous communicable diseases.*

No board of health or health officer in Michigan should permit the disinterment and removal of the body of a person dead from diphtheria, small-pox or scarlet fever, at any other season of the year than spring or summer (preferably in June or July), because there is much the most danger of the spread of these diseases in the cold weather.

When a body dead from diphtheria, or any other dangerous communicable disease, is proposed to be exhumed or reinterred, notice should be given to the Secretary of the State Board of Health, and such removal should not take place except by permission of the health officer of the locality to which the body is to be removed, and then under direction of the local health officer, and with the following precautions:—When the grave-digger has dug down to and uncovered the coffin, and before the removal of the coffin, a small opening should be made in each end of the coffin (unless it is a metallic

case), and two pounds of sulphur should be burned in the grave, so covered as to retain the fumes. (The box which is to contain the coffin may be inverted over the grave and thus fumigated.) Then the coffin should be sprinkled and drenched with a solution of corrosive sublimate containing one part of the mercuric chloride to five hundred parts of water. After the coffin is removed, it should be placed in a box which can afterwards be hermetically sealed, the coffin should be surrounded with sawdust saturated with a strong solution of corrosive sublimate—one part to five hundred—and after the outer case is hermetically closed, the case should be disinfected by exposure to the fumes of burning sulphur, or by thorough drenching with a solution of corrosive sublimate, of the strength mentioned above.

No child should be permitted to be near the place of disinterment or reinterment; and no grave-digger or other person who is present on either of these occasions should go near a child without first having a change of clothing and a thorough bath, and then not during the existence of any sore throat which may be contracted on such an occasion.

#### RESULTS OF WORK TO PREVENT DIPHTHERIA IN 1887.

The secretary presented a table and illustrative diagram showing that in those outbreaks of diphtheria in Michigan in 1887, where the recommendations of the State Board of Health as to isolation and disinfection were fully carried out there were only about one-fourth as many cases and deaths as in those outbreaks where these measures were not taken. [The table and diagram with explanations may be found on pages 234–237 of the Report of this Board for 1888. A similar table and diagram have been prepared for the year 1888, and are printed on pages 211–212 of this Report.]

#### TYROTOXICON AND CHOLERA INFANTUM.

The following resolution was unanimously adopted:—

*Resolved*, That Prof. Victor C. Vaughan, M. D., Committee of this Board on Poisons, etc., be respectfully requested to embrace every opportunity for testing for tyrotoxin in the ejecta and dejecta of infants sick with cholera infantum, and in the contents of the stomach and intestines of infants dead from cholera infantum; and that for this purpose, the Secretary of this Board be directed to endeavor to learn of the occurrence of such sickness and deaths, and of opportunities for such *post mortem* and other examinations.

#### LOCAL BOARDS OF HEALTH SHOULD RECOMMEND VACCINATION.

The following resolution offered by Dr. Lyster was unanimously adopted:—

*Resolved*, That in view of the recent outbreaks of small-pox in Buffalo, N. Y., Toronto, Ontario, and other places, it is recommended by the State Board of Health, that the several boards of health of the cities, villages and townships in Michigan, be requested to recommend the vaccination of all unprotected persons within their jurisdictions.

The law under which general vaccination may be favored by local boards of health is as follows:—



Act No. 146, Laws of 1879, entitled "An act to authorize boards of health of cities, villages, and townships to furnish vaccination to the inhabitants thereof."

SECTION 1. *The People of the State of Michigan enact*, That the board of health of each city, village, and township may, at any time direct its health officer or health physician to offer vaccination, with bovine vaccine virus, to every child not previously vaccinated, and to all other persons who have not been vaccinated within the preceding five years, without cost to the persons [person] vaccinated, but at the expense of such city, village or township, as the case may be.—§ 1685 Howell's Statutes.

Bovine vaccine virus is propagated by E. L. Griffin, M. D., Fond du Lac, Wisconsin.

#### IS TYPHOID FEVER SPREAD BY ANIMALS?

Dr. Kellogg called attention to the conflict of opinion existing as to whether typhoid fever is communicable from men to animals and from animals to men. No attention is given to the drinking water of animals. Wells and polluted streams which human beings will not use are considered good enough for cattle. If typhoid fever may be communicated to animals, this may be a very common origin of some outbreaks of typhoid fever; or even if animals have an immunity from this disease, yet, for all we know, the germs may pass through the animal without losing their disease-producing powers, and thus cause the disease to spread. Dr. Kellogg thought the subject should be investigated.

Prof. Vaughan spoke briefly, recognizing the importance of the proposed investigation. The best methods of such investigation were then discussed.

Drs. Kellogg and Vaughan are to make experiments on calves with the typhoid germ and report the results of their work to the Board.

#### THE BURNING OF GARBAGE IN THE KITCHEN STOVE.

Referring to the disposal of decomposable and waste materials from the residence, and the preservation of the purity of streams and lakes, and the prevention of the spread of disease, Dr. Lyster offered the following resolution which was adopted:—

*Resolved*, That the waste material from the kitchen and dining room can in a large majority of cases be most economically and safely disposed of by consuming it in the kitchen stove; that this method of disposal will prevent the necessity for a barrel for the temporary storage of garbage, and regular removal of the same.

#### ANALYSIS OF DRINKING WATER.

The Secretary stated that letters are frequently received at the office of the Board asking for analyses of samples of water. As a rule these letters do not state details which make out such a case as seems to make it for the general public interest that a thorough chemical and biological examination of the water should be made at the expense of the State, especially as this Board has no appropriations for such work. In reply to such letters replies are usually sent, stating where reliable chemical analyses could be obtained by paying for them, but stating that a chemical analysis alone was not suf-

ficient, and, where the surroundings of the well make the water suspicious, advising that the water be boiled before being used, whatever the chemical analysis might show.

Occasionally the details are such that knowledge of the exact condition of the water used, where sickness has occurred, would be valuable in the interests of public health. The following letter from H. C. Clapp, M. D., a prominent physician at Mendon, Mich., is an instance:—

MENDON, MICHIGAN, Oct. 15, 1888.

Dr. Henry B. Baker, Secretary of the State Board of Health :

DEAR DOCTOR :—Yesterday a family came into my hands one and a half miles north of Parkville, St. Joseph county, where there are two sick with typho-malarial fever in the second week. The father, mother and one son have died in the same house within the past year of the same fever, the last—the son—three weeks ago. Two others of the family—daughter and hired man—also had the fever and recovered during that time. Now two sons are very sick with it, and a daughter strongly threatened, and of course very much alarmed, with almost a panic in the neighborhood. Three different physicians have treated them, but failed to find cause. I have looked the premises over thoroughly, and cannot satisfy myself where the *materies morbi* is which is slaughtering this family. I was called in consultation over the daughter who recovered and the father who died, and then advised them to sink a well in another locality, which they did last June—a drive well. Since then the mother and son have sickened and died, and two now sick. I have directed them to boil both the water and milk before using, and to-day send you a jug of the well-water, requesting you to have it analyzed by Prof. Kedzie or some one competent, and send me the result as soon as convenient. The well is now quite a distance from barn or privy, 18 feet deep—privy cleaned two years ago, land lies up high and dry, a sandy loam, cellar dry and clean and well ventilated, and *no neighbors sick around them*. Have lived there a great many years, and always well, up to commencement of this endemic.

Truly yours,

H. C. CLAPP.

In this case, it had seemed to the Secretary very desirable to have chemical and biological examination of the water used. Accordingly, the jug of water had been sent to Prof. V. C. Vaughan, with the request that, if possible, he make, or cause to be made, such examination of the water as will, if possible, determine whether or not it contains the specific cause of typhoid fever. [A report of the results of the examination is printed on page 249 of this Report.]

Dr. Vaughan then stated that the State Laboratory of Hygiene at the University is now prepared to make both chemical and biological examination of water which is supposed to have caused sickness, for the bare cost of analysis, when such analyses are requested by the State Board of Health.

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A report by Arthur Hazlewood on the compensation of Health Officers was then read and ordered published in the annual report of the Board. [It is printed on pages 159-163 of this Report.]

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A report by Arthur Hazlewood on the Dietary of State Institutions was read and ordered printed in the annual report of the Board. [It is printed on pages 168-169 of this Report.]

## WEATHER AND SICKNESS.

The Secretary presented the following letter in reply to a letter transmitted by Sergeant Conger.

*Thunder Storms and their Absence,—Relations to Health.*

MICHIGAN STATE BOARD OF HEALTH, }  
OFFICE OF THE SECRETARY,  
Lansing, Mich., October 17, 1888. }

F. W. Ball, Voluntary Observer, Mich. Weather Service, Grand Rapids, Mich.:

DEAR SIR,—The question you ask of Sergt. Conger, Director of the Michigan State Weather Service, concerning the effect upon the air and health,—the relation to febrile diseases or mental troubles, of the "absence of thunder storms which has been a weather feature of the past season," has been referred to this office.

Thunder storms probably clear and purify the atmosphere because of four facts:—(1) the influence of the vibration of the atmosphere, by electrical disturbances, in depositing germs which otherwise float in the air; (2) by washing the atmosphere by the rainfall. In summer time the residual ozone in the atmosphere depends greatly on thunder storms for two reasons,—(3) the ozone is probably formed in greater quantity through the influence of the passages of electricity; and (4) the organic matter being washed out, the using up of the ozone by the oxidation of organic matter is less at the time of rainfall; the result is that ozone is most abundant about the time of thunder storms. In winter an excess of ozone is not favorable to health, but in summer, ozone is likely to be deficient for healthful existence.

A lack of atmospheric ozone is associated with certain febrile diseases, the curve representing the rise and fall of sickness from remittent fever following almost exactly after the reverse of the curve for atmospheric ozone.

Thunder storms are indirectly related to human health because of the relation of low water in wells to typhoid fever. I send you a diagram from which you will see that there is the greatest danger from typhoid fever when the water in wells is lowest,—the ground water falling, typhoid rising.

This meteorological branch of sanitary science is exceedingly new; and further observations are greatly needed, in the direction of the accurate recording of thunder storms and other meteorological data, and the facts concerning sickness from specified causes, and the comparison of the two sets of facts in order to learn the causation of diseases. Thanks to meteorological observers and observers of sickness throughout this State, more progress has been made in Michigan than anywhere else in the world. But only a small beginning has been made in this work which promises so much for the possible knowledge and control of the conditions for healthful existence.

I send you two pamphlets in which I have marked paragraphs bearing upon subjects of interest in this connection.

Very respectfully,

HENRY B. BAKER,  
Secretary.

MEETING, FEB. 7, 1889.

Members present: Hon. John Avery, M. D., President; Prof. Henry F. Lyster, M. D.; J. H. Kellogg, M. D.; Arthur Hazlewood, M. D.; Prof. Delos Fall, and Henry B. Baker, M. D., Secretary.

At the morning session, besides a large amount of routine business, such as the examination and auditing of bills and accounts, some proposed health legislation was discussed.

## COLD WEATHER DISEASES IN CHILI.

In several papers Dr. Baker has pointed out the fact that most of the diseases of the lungs and air-passages, and communicable diseases which enter by way of the air-passages, increase after the cold weather, and decrease after warm weather. In an article on pneumonia it has been suggested that one of the most important diseases would be lessened by securing the proper warming and moistening of the air breathed indoors. At this session of the Board the secretary reported having requested and received a communication from Hon. Clement Carpenter, of Toledo, Ohio, ex-Secretary of Legation to Chili, relative to his observations in Chili on this subject. Mr. Carpenter's communication was read, and was found to contain evidence which it would be difficult and perhaps impossible, to obtain in this country. It shows apparently great prevalence of all the above-mentioned diseases under conditions the reverse of those recommended by Dr. Baker for their prevention.

[This communication is printed on pages 165-167 of this Report.]

## PRECAUTIONS SHOULD BE TAKEN IN CASES OF MEMBRANEUS OR INFLAMMATORY CROUP.

At the afternoon session, after a good deal of discussion, the following resolution was unanimously adopted:—

WHEREAS, It is often impossible to discriminate between cases of diphtheria and membraneus or inflammatory croup; and

WHEREAS, Modern researches point to a probable common origin of these diseases,

*Resolved*, That in the opinion of this Board, membraneus or inflammatory croup should be classed with diseases communicable and dangerous to the public health, and should be reported as such, and the same precautions should be taken in cases of this disease, as regards isolation and disinfection, as in cases recognized as diphtheria.

The Secretary presented a report by Prof. Vaughan of the examination and analysis of water, sent by Dr. Clapp of Mendon, Michigan, by way of the office of the State Board of Health, the water having been suspected of causing typhoid fever.

[A full report of the results of this analysis and examination is printed on page 249 of this Report.]

## REGISTRATION OF PLUMBERS.

The following resolution presented by Dr. Henry F. Lyster, was, after discussion, unanimously adopted:

*Resolved*, That it is the opinion of this Board that it is desirable that all persons engaged in the mechanical trade of plumbing or acting as plumbers should be licensed and registered, and that their work should be supervised by inspectors appointed by authority,—this to apply to all cities and villages in the State.

*Resolved*, That it is advised that, when revisions of charters are being made by authorities of cities and villages, the incorporation of these provisions in their respective charters be asked from the State legislature.

## SANITARY CONVENTIONS.

Invitations to hold sanitary conventions at Otsego and at Tecumseh were accepted, and the secretary was authorized to meet with committees of citizens, and to perfect arrangements for the same.

## ARSENICAL PAPER, CARD-BOARD, TOYS AND FABRICS.

The secretary exhibited before the Board a toy (called a "Kazoo" and designed to be put in the mouth) which had caused sickness in Lansing. The part which came in contact with the mouth was found to be covered with green arsenical paper. The secretary stated that frequently boxes made of arsenical card-board were received at the office. Poisonous card-board is not infrequently used for tickets. On motion of Dr. Kellogg, the secretary was authorized to draft a bill to be presented to the next legislature proposing the prohibition, under penalty, of the manufacture and sale of arsenical paper, card-boards, fabrics, toys and other articles.

## TYROTOXICON IN OYSTERS.

Dr. Kellogg called attention to a recent case of tyrotoxin in oysters. A boy in a printing office in Battle Creek took an oyster stew at a restaurant at 11 o'clock at night. The stew was very slightly warmed. In a few hours he was taken very sick with vomiting and purging and was sick all the next day. Dr. Kellogg sent for some of the oysters and obtained a good test for tyrotoxin. A few days afterwards he sent for some more oysters from the same restaurant from which also he obtained tyrotoxin. He thought the probable reason why there was not more frequent cases of poisoning by eating oysters was that the tyrotoxin was destroyed by heat in cooking. The oysters had been received in kegs and kept open, thus giving a good opportunity for the tyrotoxin to develop.

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REGULAR MEETING, APRIL 9, 1889.

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Members present: Hon. John Avery, M. D., President; Arthur Hazlewood, M. D.; Prof. V. C. Vaughan, M. D.; Prof. Delos Fall, and Henry B. Baker, M. D., Secretary.

At the morning session, besides routine business such as the examination and auditing of bills and accounts, Dr. John Avery, President of the Board, instead of a formal annual address, made a few remarks concerning the increasing value of the work of the Board in collecting and spreading among the people information useful for the saving of life, and concerning the necessity of continuing the work of investigation and of impressing upon the people the facts already demonstrated concerning the prevention and restriction of the dangerous communicable diseases.

## RELATION OF FILTH TO DISEASE.

Considerable attention was given to a discussion of the influence of unsanitary surroundings in affecting the virulence of disease. After the subject had been very thoroughly discussed, a motion prevailed that Dr. V. C. Vaughan be requested to prepare a paper presenting what evidence he could procure on the influence of filth on disease.

## ELECTION OF PRESIDENT.

This being the regular annual meeting and the time for the election of President, Hon. John Avery, M. D., of Greenville, was re-elected for the term of two years.

## A FATAL DISEASE IN CONCORD TOWNSHIP.

A report by Prof. Delos Fall, of a fatal outbreak in Concord township was presented and discussed. [It is printed on pages 222-225 of this Report.]

## PROPOSED HEALTH LEGISLATION.

The Secretary presented copies of the following bills, which, by direction of the Board at its last meeting, he had transmitted to the health committee of the House of Representatives:

A Bill, to require the labeling of all gasoline, benzine and naphtha sold at retail.

A Bill, to prevent the introduction of dangerous communicable diseases into any township, city or village in Michigan, except under specified regulations.

A Bill, to prevent the sale and use of infected milk and milk products, by prohibiting the sale and providing for the punishment of offenders.

A Bill, to prevent the spread of dangerous communicable diseases by providing for the punishment of offenders.

A Bill, to declare the least proportion of milk solids and of fat in unadulterated milk.

The secretary also presented House bill No. 671 (File No. 201), introduced by Representative Hanscom, entitled,—

A BILL, to Regulate the Practice of Medicine, requiring certain Qualifications of persons beginning the Practice of Medicine in Michigan, and the Registration of all Practitioners; repealing sections 1, 2, 4, 5, 6 and 7 of Act No. 167, Laws of 1883, and section 2 of Act No. 268, Laws of 1887, and all other acts or parts of acts inconsistent with this act.

## SANITARY CONVENTION.

The Board accepted an invitation from citizens of Lapeer to hold a sanitary convention in that place, and early in September was suggested as the time for such convention.

## CULTURES OF DISEASE GERMS.

Dr. V. C. Vaughan, having with him thirty or forty pure cultures of disease germs, was asked by the Board to exhibit them. Among these cultures were the following:—the germ of white pus; the lactic acid ferment; Friedländer's butyric acid ferment (the possible cause of tyrotoxinon); Dencke's bacillus (found in cheese and resembling Koch's comma bacillus); the wurzel bacillus (so called because the cultures branch out like roots); the blue milk bacillus; Emerich's cholera germ (sometimes called the Naples germ, which has since been found in the normal fæces,—Emerich has given up the idea of its being the cause of cholera; it resembles somewhat the typhoid germ); Salmon's germ of hog cholera; *micrococcus prodigiosus* (the cause of red bread); Loeffler's diphtheria germ; and the *bacillus tuberculosis*, this culture being of especial interest because it is the 115th generation of Koch's original culture.

At the request of the Board, Dr. Vaughan then gave a short account of his work in Prof. Koch's laboratory of hygiene, at Berlin, of Koch's lectures on hygiene, and Prof. Fränkel's lectures on bacteriology; also of inoculations against hydrophobia witnessed by Prof. Vaughan in Pasteur's laboratory at Paris.

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ABSTRACTS OF QUARTERLY REPORTS, PRESENTED BY THE  
SECRETARY AT REGULAR MEETINGS OF THE BOARD, OF  
WORK DONE IN THE OFFICE OF THE STATE BOARD OF  
HEALTH, DURING THE FISCAL YEAR 1889.

## REPORT FOR QUARTER ENDING JULY 10, 1888.

The office during the quarter has received information of and taken action concerning 27 outbreaks of typhoid fever, 59 outbreaks of diphtheria and 84 outbreaks of scarlet fever. To the localities where these outbreaks have occurred, the usual number of documents on the restriction and prevention of these diseases have been sent for distribution to those most interested. The office has also received information concerning 91 outbreaks of measles.

Since the last meeting of the Board the printing on the Proceedings of the Sanitary Convention at Traverse City has been finished, the Proceedings of the Convention at Owosso have been printed, and the Proceedings of the Convention at Albion have been edited and are in the hands of the printer. June 5 and 6, a sanitary convention was held under the auspices of the Board at Manistee. Members of the Board were in attendance at this Convention.

The printed proceedings of the last regular meeting of this Board have been sent to Sanitary Journals, Secretaries of State Boards of Health, and other sanitarians. Extracts therefrom have appeared in numerous periodicals.

The Annual Report of the Board for 1886 has been received from the printer, and about 400 copies have been sent out, one copy in a place, by mail. Copies of the supplements (Sanitary Conventions at Traverse City,

and at Owosso) have also been sent to sanitarians, and to persons in the places where the conventions were held:

A second demand has been made on clerks of delinquent cities, villages and townships, for a return of the name and address of the health officer. There have been received, filed and entered in the books, the names of health officers of 40 cities, 178 villages, and 1,025 townships. Documents explanatory of the proper work of health officers and of local boards of health have been sent to each health officer whose name has been returned, also to the clerk or supervisor making the return.

A demand has been made on new health officers of cities and villages for weekly card-reports of sickness under observation.

The article on meteorology for the Report of 1887 is in the hands of the printer, and the article based on weekly reports of diseases is ready to send down as soon as the article on meteorology is printed. The facts concerning scarlet fever and typhoid fever in 1887 have been compiled for the article on communicable diseases.

The summary of meteorological observations for each month at this station has been regularly sent to the chief signal officer at Washington and to Sergt. Conger, of the State service; and the weekly and monthly summary has been compiled and used in comparison with weekly and monthly reports of diseases in Michigan. Fifteen meteorological tables, and their accompanying diagrams for the year 1887 have been completed, and the work of compilation of tables for 1888 has been begun.

The compilation of the annual reports of health officers and clerks of cities, villages, and townships for the year 1887 has been completed so far as relates to the communicable diseases.

During the quarter, 124 books and pamphlets have been received and placed in the library of the Board—fifty of them being periodicals which had been previously received and recently bound by the state binders.

During the quarter, 637 pages of hektograph work have been executed, among which was a circular informing a large number of health officers of the entrance into their jurisdiction of a person or persons who had been exposed to scarlet fever, a circular to superintendents of State institutions asking for bills of diet at those institutions, and several proposed bills for the prevention and spread of dangerous communicable diseases, the adulteration of milk and milk products, and the sale of certain explosives without proper labels,—copies of these bills being thus submitted for criticism and amendment to members of this Board and other persons.

The reports from the different State institutions relating to diet lists, when received, were sent to Prof. Vaughan, the committee of this Board on foods. They have been returned in order to be presented to this Board at this meeting.

#### HEALTH IN MICHIGAN IN THE SECOND QUARTER OF 1888.

##### *Contagious Diseases.*

Compared with the preceding quarter (January, February and March), reports received from all sources show the number of places at which diphtheria was reported, to have decreased by an average of nineteen places per month, scarlet fever to have decreased by an average of two places per



month, typhoid fever to have decreased by an average of ten places per month, and measles to have decreased by an average of fourteen places per month. Small-pox was reported at one place in each quarter.

*Meteorology, and Sickness from all Causes, Compared with the Preceding Quarter.*

A comparison of the meteorological conditions of the second quarter of 1888, with the meteorological conditions of the preceding quarter, shows the temperature to have been much higher, the absolute humidity to have been much more, the relative humidity to have been about the same, the day ozone slightly less and the night ozone slightly more in the second quarter.

Compared with the preceding quarter (January, February and March), the reports from regular observers show a marked increase of measles, and a marked decrease of influenza, pneumonia, bronchitis and neuralgia, in the second quarter of 1888.

*Compared with Nine Years, 1879-1887.*

A comparison of the meteorological conditions of the second quarter of 1888, with the average of the corresponding quarters in the nine years, 1879-1887, shows that in 1888 the temperature was slightly lower, the absolute humidity was slightly less, the relative humidity was the same, and the day and night ozone considerably less in the second quarter of 1888.

Compared with the corresponding quarter in the nine years, 1879-1887, the reports received from regular observers indicate that measles was more than usually prevalent, and that intermittent fever, remittent fever, consumption of the lungs, diphtheria, diarrhea, and whooping-cough were less than usually prevalent in the second quarter of 1888.

These statements are for the State of Michigan as a whole; in certain localities there has been more, in other localities less sickness than usual.

HENRY B. BAKER,  
Secretary.

REPORT FOR THE THIRD QUARTER OF 1888, OCT. 23, 1888.

During the quarter the office has received information of and taken action concerning 45 outbreaks of typhoid fever, 40 outbreaks of diphtheria and 31 outbreaks of scarlet fever. There were also reported during the quarter 27 outbreaks of measles. During the first part of the quarter there was one case of small-pox at Detroit.

Since the beginning of the quarter there have been received and entered in the library of the Board 130 volumes,—mostly in exchange for publications issued by this Board.

To the health officers of cities, villages and townships, there has been sent during the quarter a copy of the list of health officers, with a pamphlet on the restriction and prevention of the communicable diseases. Where the name of a health officer had not been reported to this office as the law requires, the delinquency was marked in the list of health officers sent to that locality; this caused several new returns to be made.

To the health officers of cities and villages, and to prominent sanitarians, there have been sent copies of the proceedings of the last regular meeting

of this Board, also a copy of the proceedings of the Albion Sanitary Convention.

About twelve hundred copies of the annual report for 1886, have been distributed among prominent sanitarians, physicians, local boards of health and others.

The proceedings of the Manistee sanitary convention have been edited and printed, and a few copies have been distributed.

Proof has been read on the remainder of the report for 1887, the index has been made, the report has been received from the State binders, and the distribution of the same has been begun.

The first part of the report for 1888 has been sent to the State printers, and the article on meteorology for this report is now ready to be printed. The article on the causation of disease, for the report of 1888, is nearly completed. Considerable work has also been done on the article to be printed in the report for 1888, summarizing the experience of health officers in the restriction of the communicable diseases.

A summary of meteorological conditions in Michigan, covering periods of from four to twenty-four years, at from twelve to twenty-two meteorological stations, was, by request, compiled and sent to the Imperial Observatory, Rio Janeiro.

Eleven diagrams, illustrating relations of sickness and deaths from diphtheria to isolation and disinfection, and of intermittent fever and malarial diseases to atmospheric temperature, have been made.

A summary of meteorological conditions at this office for each month has been sent regularly to the Chief Signal Officer at Washington, and a summary for each week has been used in connection with weekly reports of diseases in Michigan.

During the quarter, the library case in the office of the Board has been extended, so as to accommodate our rapidly growing library. Some of the books have been re-arranged, so that now the best use can be made of the 6,590 volumes belonging to the Board.

The library is made useful to persons, in different parts of the State, who are studying special branches of sanitary science or public sanitary administration, such as those who read papers before the sanitary conventions, health officers of cities and villages, etc.

The Secretary had the pleasure of attending a meeting of the committee of this Board on Plans for Model School Houses, held at the State Capitol, and of listening to its deliberations. He has since transmitted to the chairman and one of the members of the committee blue print plans drawn up by Mr. Bowd, the architect, in furtherance of the work of the committee.

During the quarter 434 pages of hektograph work have been executed. Among these were letters bearing on the following subjects:

#### EPIDEMIC DYSENTERY IN PRESQUE ISLE CO.

Several newspaper reports having been received of a disease in Presque Isle county resembling cholera, a hektograph letter was sent to all the health officers in Presque Isle county, asking for particulars concerning this outbreak. [Some of the replies are printed on pages 278 and 279 of this Report.]

## PROPOSED REMOVAL OF A BODY DEAD FROM DIPHTHERIA.

October 11, a letter was received from H. P. Dearing, General Baggage Agent of the Michigan Central Railroad, enclosing a request from Rev. A. W. Gower for the removal of the body of a child dead from diphtheria.

On the receipt of these communications from Mr. Dearing, the following letter was sent to the health officers of Battle Creek, Lawrence, and Lawton, to Rev. A. W. Gower and to Mr. Dearing:—

*Bodies Dead from Diphtheria Should Not be Removed in Cold Season  
of the Year.*

MICHIGAN STATE BOARD OF HEALTH, }  
OFFICE OF THE SECRETARY, }  
*Lansing, Mich., Oct. 11, 1888.* }

DEAR SIR:—Relative to the application for the removal of the body of the child of Rev. A. W. Gower, of Lawrence, Van Buren County, Michigan, the child having died of diphtheria the last of May, 1887, the proposed removal to be by rail from Lawton to Battle Creek,—I feel it my duty to advise that no removal be permitted at this season of the year, and not until a longer time has elapsed since the death. In Michigan, diphtheria is most dangerous in the cold season, and next to consumption it is the most fatal disease we have.

If application is made in June or July, it will be more likely to be approved, both because of the season of the year and the time that has elapsed, though it would be still better to wait until some subsequent summer.

By this mail I send a few pamphlets with marked paragraphs bearing upon the subject of this letter.

Very respectfully,

HENRY B. BAKER,

*Secretary.*

Accompanying this letter pamphlets were sent, bearing on the points made, as follows:

*Diphtheria is Most Prevalent During Cold Weather.*

In one of the pamphlets sent (The Causation of Cold-weather Diseases), a table and diagram were marked showing, from over 41,000 weekly reports of sickness, and over 190,000 observations of the atmospheric temperature, that diphtheria unmistakably increases after the atmosphere is cold and dry, and decreases after the atmosphere is warm and moist. Similar diagrams are to be found in this pamphlet showing that scarlet fever and small-pox are controlled in their rise and fall by the fall and rise of the temperature. Thus, though these diseases are due to the inhalation through the air-passages of a specific germ and are communicated from person to person, during the cold weather when the air-passages are most susceptible these diseases are most likely to spread.

*Necessity for Disinfection in Diphtheria.*

A pamphlet was sent showing the necessity for disinfecting to destroy the germs of diphtheria, and the methods of disinfection. With this was sent a

diagram showing that in those outbreaks of diphtheria in Michigan in 1886, where the precautions recommended by the State Board of Health were not carried out, where patients were not isolated and premises were not disinfected, there were about five times as many cases and deaths as where these precautions were carried out. This diagram shows that in 116 outbreaks alone there were saved 298 lives and over 1,500 cases of sickness from diphtheria in Michigan in a single year by improved methods for its prevention and restriction. Fumigation by burning sulphur was the method of disinfection followed in these cases, and it is thus shown to be effective for the destruction of the diphtheria germ. Three pounds of sulphur should be burned to each thousand cubic feet of air-space in the room to be disinfected.

### *Importance of Preventing Diphtheria.*

Another pamphlet (Prévention of the Communicable Diseases) was sent, in which paragraphs were marked, showing that, next to consumption, diphtheria was the disease which caused the most deaths in Michigan, and urging the necessity of educating the people as to the methods of restricting the spread of the dangerous communicable diseases, because it is now known that they are preventable and how they may be prevented. This should certainly be regarded as the most important work which a local board of health can undertake.

### GLANDERS REPORTED TO THE STATE BOARD OF HEALTH.

Sept. 27, a telegram was received from Dr. B. D. King, health officer of Muskegon, stating "case of glanders here; send State Veterinarian." A telephone dispatch was at once sent to the State Veterinarian, and a letter to the President of the State Live Stock Commission, transmitting this telegram. Afterwards a letter was received from Dr. King stating that he did not know the name of the State Veterinarian or he would have reported to him direct, and saying, "So, if you have not already done so, I wish you would inform him, or send me his name and address so I will be able to communicate with him."

The amendment (passed at the last session of the Legislature) to the Act providing for the appointment of the State Live Stock Commission makes it the duty of any person who discovers or suspects a case of glanders, hydrophobia or any other infectious or contagious disease in animals to report the fact to the State Live Stock Commission or some member thereof, instead of to the health officer, president or clerk of the local Board of Health as previous to the amendment. As the address of the members of the Live Stock Commission is not generally known, and as the Commission has no central office, and the State Board of Health has a central office at Lansing, notices of such outbreaks are sent to the Secretary of the State Board of Health, and a great deal of circumlocution is necessary to carry out the law requiring first notice to be sent to the State Live Stock Commission.

Glanders is a disease dangerous to man; therefore notice of a case should be made to the local health officer, and by him be reported to the State Board of Health, for purposes of information in the interests of the public safety, even though, under the present law, it may have been the intention

of the Legislature that this disease should be wholly under the management of the State Live Stock Commission.

#### HOW DIPHTHERIA IS SPREAD.

At the last regular meeting of the State Board of Health, a proposed bill was considered, the object of which bill, if made a law, is to prevent any person, infected with a dangerous communicable disease, traveling on the cars or in other public conveyance, and otherwise needlessly exposing others. The necessity for some such law is illustrated by a letter recently received at the office of the State Board of Health from Dr. E. Conley, of Fostoria, Tuscola County, Michigan.

This letter gives particulars concerning a fatal case of diphtheria in the township of Rich, Lapeer County. The patient had been engaged in the lumber woods at Roscommon, Michigan, all summer until Sept. 18, when he took the train for Otter Lake, Lapeer County, and rode home, about ten miles, in a buggy. Dr. Conley says: "I was immediately summoned to see him, found him in a dying condition with the worst form of diphtheria I ever saw, nasal, pharyngeal and laryngeal varieties combined. He died in about two hours after his arrival home. He was sick three or four days at Roscommon, and was treated by a physician there who, according to the young man's statement and others with him, did not make that diagnosis. I do not know who the physician is, but I do not believe he failed to make the diagnosis, but on the other hand believe the young man, learning what he had, ran away from them in his anxiety to get home. He was seen at Otter Lake by a physician who diagnosed diphtheria, and permitted him to be sent home. He must have been in a dying condition when he left Roscommon, and it must have been exceedingly difficult to occupy the same car with him, the stench was so intense and offensive. The parties with him and himself called it blood-poisoning—thus being allowed to ride on the cars. There was certainly blood-poisoning, but of a diphtheritic character."

Although diphtheria is not usually dangerous to adult persons, it is very dangerous to children, especially during cold weather, and in Michigan causes ten times as many deaths as small-pox does. Not only health officers but all classes of people should do their utmost to prevent such dangerous exposures as are liable to occur from allowing such a case as this one to travel.

In this particular case, a law punishing the sick person would not have hindered his movements; but a law requiring the restraint by force, if necessary, of any such infected person might, perhaps, have been enforced. But the most important need is that every one shall understand the terrible consequences which may result from permitting persons infected with such an extremely dangerous disease as diphtheria to travel.

#### HEALTH IN MICHIGAN IN THE THIRD QUARTER OF 1888.

##### *Contagious Diseases.*

Compared with the preceding quarter (April, May and June), reports received from all sources show scarlet fever to have decreased by an average of seven places per month, measles to have decreased by an average of thirteen

places per month, typhoid fever to have increased by an average of four places per month, and diphtheria to have increased by an average of one place per month, in the third quarter of 1888. Small-pox was not reported in the third quarter of 1888.

*Meteorology, and Sickness from all Causes, Compared with the Preceding Quarter.*

A comparison of the meteorological conditions of the third quarter of 1888, with the meteorological conditions of the preceding quarter, shows the temperature to have been much higher, the absolute humidity to have been much more, the relative humidity to have been more, and the day and night ozone to have been less in the third quarter of 1888.

Compared with the preceding quarter (April, May and June), the reports from regular observers show a marked increase of diarrhea, dysentery, cholera morbus, cholera infantum, remittent fever and typhoid fever; and a marked decrease of pneumonia, influenza, tonsillitis, bronchitis, inflammation of kidney, rheumatism, scarlet fever and neuralgia in the third quarter of 1888.

*This Quarter Compared with the Average for Nine Years—1879–1887.*

A comparison of the meteorological conditions of the third quarter of 1888, with the average of corresponding quarters in the nine years 1879–1887, shows that in 1888 the temperature was lower, the absolute and the relative humidity about the same, and the day and night ozone\* less in the third quarter of 1888.

Compared with the average for the corresponding quarter in the nine years 1879–1887, the reports received from regular observers and others indicate that intermittent fever, tonsillitis, remittent fever, whooping-cough, diphtheria, typho-malarial fever, cholera infantum, membranous croup, consumption of the lungs, diarrhea and cholera morbus were less prevalent, and that there was no disease more than usually prevalent in the third quarter of 1888.

HENRY B. BAKER.

REPORT FOR THE QUARTER ENDING JANUARY 8, 1889.

During the quarter the office has received information of and taken action concerning 85 outbreaks of diphtheria, 77 outbreaks of scarlet fever, 48 outbreaks of typhoid fever and one of typhus fever. There have also been reported to the office outbreaks of small-pox in Port Huron, East Saginaw, Howell village, Howell township, New Haven township, Lansing, Cheboygan and Detroit. The office has been in constant communication with most of these localities, and neighboring localities, urging the vaccination of all susceptible persons and the thorough isolation of all those who could possibly convey the disease.

In response to a letter asking the opinion of the members of the Board, a majority of the members expressed the opinion that a letter should be sent to the Governor stating the facts concerning the existence of small-pox in other States and the probability of its reaching this State. In accordance

\*Allowance is made for less sensitive test paper used in 1883 than in preceding year.

with this expressed opinion, November 27, 1888, a letter was sent to the Governor referring to the law passed in 1885 providing for an inspective service to prevent the introduction and spread of dangerous communicable diseases. The letter stated that the State Board of Health was prepared to maintain such inspection "whenever, in the opinion of the Governor, it may be deemed necessary." The letter indicated that the present year was a year when small-pox might be expected, gave the names of States where small-pox at that time prevailed, called special attention to the outbreak in Sarnia and the cases which had occurred in East Saginaw and Port Huron.

A copy of the letter to the governor was sent to each member of this Board. November 14, a copy of the proceedings of the Board at its October meeting was sent to the health officer of every city and village in Michigan, with a marked paragraph giving the resolution of this Board urging local boards to recommend general vaccination, and giving the law authorizing local boards to furnish free vaccination.

December 7, a circular which had received the approval of the members of the Board was sent to the health officer of every city, village and township in the State urging local boards to recommend the vaccination and re-vaccination of all unprotected persons in their jurisdiction. Several letters were received in response to this circular, stating that the local Board of Health had issued a notice urging general vaccination, or that free vaccination was being offered to all, or to those unable to pay for it.

No response was received from Grand Rapids until there was received a marked copy of the Grand Rapids *Democrat* of December 21, in which the health officer of Grand Rapids was reported as saying in an interview that there was not any probability of the Board of Health of that city urging a general vaccination, because the emergency had not arisen. In reply, the Secretary of this Board sent a communication to the Grand Rapids *Democrat* urging the importance of the vaccination and re-vaccination of all unprotected persons. Some correspondence followed these communications. The difference between the Grand Rapids Board of Health and the State Board of Health seems to be that this board has recommended the *prevention* of small-pox by the only known means, vaccination and re-vaccination, the Grand Rapids Board did not propose to recommend this, but to rely upon the *restriction* of the disease after it reaches them.

December 24, on receipt of notice from Dr. J. A. Wessinger that two children of Oliver Anderson (who was sick with small-pox), in Howell, Mich., had been sent to Chatham, Ontario, a letter and telegram were at once sent to the health officer of Chatham, giving the information. In reply a letter was received from the town clerk, and also a copy of the *Banner*, published at Chatham, from which the following quotation is taken:

"The telegram was a most kind and neighborly warning, and was promptly acted upon. Dr. Hall, Medical Health Officer, at once had the family isolated at the residence of their grandmother, King street, east, and Chief Young has arranged for a continuous guard of the house day and night. The clothes of the family, bedding, and indeed the whole premises, have been fumigated and disinfected, and the wearing apparel of the children cremated.

"There are no indications of small-pox in the family, nor of any disease; but the authorities being aware that the children were exposed to the contagion, act on the principle of making sure; and an ounce of prevention is worth a pound of cure in such cases. A few days' careful quarantine will well repay the work if there is any risk to be avoided. The Michigan Board of Health deserves the thanks of the people of Chatham for their prompt warning."

About one thousand more pamphlets than are usually sent out during a quarter have been sent to those localities where diphtheria, scarlet fever and typhoid fever prevailed, bearing on the restriction and prevention of these diseases. A large number of pamphlets on the prevention of small-pox have also been sent to those localities where this disease has prevailed.

The numerous outbreaks of small-pox in Michigan have occasioned considerable correspondence with localities adjoining or near to infected localities. As an illustration of such correspondence, reference may be made to a letter received from the president of the village council of Brighton, stating that proper restrictive measures were not taken in the village of Howell. A copy of this letter was sent to the members of the board and to the health officer of Howell. In response, the health officer of Howell visited the office of this board for conference, and the Board of Health of Howell held a meeting and on motion took possession of a large square house in the outskirts of the village for a hospital.

In response, I was able to say to the President of the Board of Health of Brighton, that I had taken the liberty to present the questions he had asked to the health officer of Howell, who says that there are four cases of small-pox at Howell—including two cases of varioloid—and one suspected case; that all persons suspected of being liable to communicate the disease are isolated, and that efforts are being made to find such persons. No one liable to spread the disease is allowed on the streets.

During the quarter 94 volumes and pamphlets have been received and entered in the library of the Board, of which 27 were by purchase, and 67 were by gift or exchange.

Since the last meeting of the Board there have been 1,007 pages of hektograph work executed. Of these 233 were notifications of and other correspondence relative to outbreaks of small-pox in Port Huron, Lansing, New Haven, Howell and Cheboygan; 77 were circulars urging local boards to encourage vaccination, and the rest pertain to the general work of the Board. A hektograph letter was sent to some health officers in Michigan recommending that they attend the meeting of the American Public Health Association in Milwaukee.

The printed proceedings of the last meeting of this Board have been sent to health officers of cities and villages, sanitary journals, prominent sanitarians, etc.

During the quarter about twenty-five hundred copies of the Report for 1887 have been distributed. This includes those sent to the health officers of cities, villages and townships, and to lists of names supplied by members of the Board. With some of these reports there was sent a supplement giving the proceedings of the Manistee Sanitary convention, and other publications.

December 3 and 4 a profitable sanitary convention was held in Hastings under the auspices of the Board. Most of the papers read at this convention are now in the office of the Board.

Blanks and circular letters asking for an annual report have been sent to every health officer in the State, also to the clerk of every local board of health; 242 reports have been received at this date (Jan. 7).

Proof has been read on the Annual Report of the Board for 1888, all of which has now been printed except the article on the communicable diseases, which is ready to print. The report has been indexed as fast as it has been printed.



Three diagrams illustrating an article in the Annual Report for 1888 have been made and sent to the engraver. The plates have been received.

A monthly summary of meteorological conditions at this station has been regularly sent to the chief signal officer at Washington, a briefer one supplied to the director of the Michigan Weather Service, and a summary for each week has been used in connection with the weekly reports of diseases in Michigan.

Blank meteorological registers, stamped envelopes, etc., have been sent to meteorological observers for their use during the year 1889.

Since the last meeting of the Board compilations of meteorological conditions for each month in 1888, except December, on registers from nineteen stations, have been carried on and are nearly completed.

#### PREVENTION OF SMALL-POX UNDER DIFFICULTIES.

About election time (November, 1888) a man came from Fargo, Dakota, to Howell, Livingston county, Mich., sick with varioloid. The disease was not recognized at first in Howell; but was called chicken-pox, therefore it spread somewhat. The disease was carried from Howell to Azalia, in Milan township, Monroe county, where again it was not recognized. While it was being mistaken for another disease the president of the local board of health of Milan township was exposed to it and was then isolated. The other members of the board endeavored to cope with the disease, and a committee of citizens was appointed to coöperate with them as a health committee. They were unable to take proper precautions because of lack of funds and lack of confidence of the people that the bills would be allowed by the Board of Supervisors; and they came to Lansing to consult with the Secretary of this Board as to what action should be taken. The Secretary referred them to decisions of the Supreme Court, which seemed to indicate that the Board of Supervisors must audit all claims allowed by the local board. Members of the committee stated that members of the Board of Supervisors of their county (Monroe) had expressed themselves as not favorable to allowing such bills, and that, therefore, the committee knew of no way of obtaining money to cope with the disease, that a number were sick and many more had been exposed and should be isolated. These facts were laid before the Governor, also the fact that if the disease was not stamped out in Azalia, it was likely to spread to other parts of the State; and on this presentation the Governor authorized the use of a small amount of the appropriation under Act No. 230, laws of 1885, to provide for the prevention of the introduction and spread of cholera and other dangerous diseases.

A mistaken idea has been expressed that the Governor has ordered that bills be sent to the State Board of Health for payment by the State of all expenses incurred in Michigan in restricting small-pox. There is no such general order, and probably will not be. In this one specified instance in which the circumstances were exceptional, and there seemed to be danger of the spread of the disease about the State, provision was promptly made by the Governor to prevent the spread of small-pox. [The small-pox was promptly stamped out there, as will be seen by reference to the report for the quarter ending April 9, further on.]

## HEALTH IN MICHIGAN IN THE FOURTH QUARTER OF 1888.

*Contagious Diseases.*

Compared with the preceding quarter (July, August and September), reports received from all sources show diphtheria to have increased by an average of fifteen places per month, scarlet fever to have increased by an average of twenty-one places per month, typhoid fever to have increased by an average of six places per month, small-pox to have increased by an average of four places per month and measles to have decreased by an average of four places per month.

*Meteorology, and Sickness from all Causes, Compared with the Preceding Quarter.*

A comparison of the meteorological conditions of the fourth quarter of 1888, with the meteorological conditions of the preceding quarter shows the temperature to have been much lower, the absolute humidity to have been much less, the relative humidity and the night ozone to have been more, and the day ozone to have been less in the fourth quarter of 1888.

Compared with the preceding quarter (July, August and September), the reports from regular observers show a marked increase of tonsilitis, influenza, bronchitis, rheumatism, pneumonia and typho-malarial fever, and a marked decrease of diarrhea, cholera morbus, dysentery, cholera infantum and consumption of the lungs in the fourth quarter of 1888.

*This Quarter Compared with the Average for Nine Years, 1879-87.*

A comparison of the meteorological conditions of the fourth quarter of 1888, with the average of corresponding quarters in the nine years, 1879-1887, shows that in 1888, the temperature was slightly higher, the absolute humidity was slightly less, the relative humidity was less, the day ozone\* was slightly more and the night ozone\* was about the same in the fourth quarter of 1888.

Compared with the average for the corresponding quarters of the nine years, 1879-1887, the reports received from regular observers indicate that intermittent fever, consumption of the lungs, diphtheria, remittent fever and pneumonia were less prevalent, and that there was no disease more than usually prevalent in the fourth quarter of 1888.

*This Quarter Compared with the Average for Two Years, 1886-7.*

A comparison of the meteorological conditions of the fourth quarter of 1888 with the average of corresponding quarters in the two years, 1886-87, shows that in 1888, the temperature was slightly higher, the absolute humidity was slightly more, the relative humidity and the day and the night ozone\* were less in the fourth quarter of 1888.

Compared with the average for the corresponding quarters of the two years, 1886-87, the reports received from regular observers indicate that consumption, diphtheria and pneumonia were less prevalent, and that there was no disease much more than usually prevalent in the fourth quarter of 1888.

\* Allowance is made for less sensitive test paper used in 1888 than in the preceding year, .51 for the day ozone and .42 for the night ozone.

## REPORT FOR THE QUARTER ENDING APRIL 9, 1889.

During the quarter the office has received information of and taken action relative to 87 outbreaks of diphtheria, 131 outbreaks of scarlet fever, 38 outbreaks of typhoid fever, and 13 outbreaks of small-pox. The usual number of documents on the restriction of these diseases have been sent to the localities where these diseases prevailed.

A printed abstract of the proceedings of the Board at its last meeting has been sent to health officers of cities and villages, sanitary journals, prominent sanitarians, etc.

A circular letter and blank for the annual return of the name and address of health officer have been sent during the quarter to the supervisors of townships, the clerks of villages and cities and to the presidents of villages and the mayors of cities, and replies are being rapidly received.

During the quarter there have been sent out about 500 copies of a circular, "Now is a Good Time to be Vaccinated;" also about 1,200 copies of a pamphlet on the restriction and prevention of small-pox.

During the quarter, the Secretary visited Otsego and Tecumseh to make arrangements for sanitary conventions in those places. The printed announcements for these conventions have been sent out.

During the quarter 120 books and pamphlets have been received and entered in the library of this Board, mostly in exchange for the publications of this Board.

Annual reports have been received from 587 health officers and 620 clerks of townships, cities and villages. All the cases and deaths from diphtheria, scarlet fever, typhoid fever and measles mentioned in these reports have been compiled. All the letters and reports received concerning the dangerous communicable diseases in Michigan in 1888 have been assorted, and the compilation of the same has been begun.

Three hundred and eighty-seven blanks giving names of medical practitioners have been received, arranged and filed.

Proof has been read on the last part of the Annual Report for 1888; it has been indexed, and copies should now be ready for distribution; but are not yet received from the State printer.

The proceedings of the sanitary convention at Hastings have been edited, with the exception of a few papers which have not as yet been received. The copy has been sent to the State printer.

Accounts for expenses, for nurse hire, etc., in restricting the epidemic of small-pox at Azalia to the extent of four hundred dollars have been audited and paid. The small-pox was stamped out.

During the quarter, 374 pages of hektograph work have been executed, among which may be mentioned various bills in the interest of public health sent to members of this Board and others, and finally presented to the Legislature.

A monthly summary of meteorological conditions at this station has been regularly sent to the chief signal officer at Washington, a briefer one supplied to the director of the Michigan Weather Service, and a summary for each week has been used in connection with the weekly reports of diseases in Michigan.

Compilations of meteorological conditions for the year 1888 at 21 different stations have been made and are ready to be tabulated.

Since January 1, 1889, a 7 P. M. observation of average temperature, absolute and relative humidity, per cent of clouds, direction of wind, barometer and ozone, has been made daily at the State Board of Health office, and by the observers at Thornville, Ann Arbor and Kalamazoo. Since February 1, such observation has been taken at three other stations in the State.

During the quarter, 21 diagrams have been made, illustrating the Annual Report for 1889, the proceedings of the Sanitary Convention at Hastings, and some statistics collected and compiled for Prof. Vaughan, relating to diseases of infancy.

The compilation of the weekly reports of diseases for 1888, to be printed in the Annual Report for 1889, is well under way.

## HEALTH IN MICHIGAN IN THE FIRST QUARTER OF 1889.

### *Contagious Diseases.*

Compared with the preceding quarter (October, November and December, 1888), reports received from all sources show diphtheria to have increased by an average of two places per month, scarlet fever to have increased by an average of sixteen places per month, typhoid fever to have decreased by an average of thirteen places per month, measles to have increased by an average of two places per month, and small-pox to have increased by an average of five places per month.

### *Meteorology, and Sickness from all Causes, Compared with the Preceding Quarter.*

A comparison of meteorological conditions of the first quarter of 1889 with the meteorological conditions of the preceding quarter shows the temperature to have been considerably lower, the absolute humidity to have been less, the relative humidity to have been more, and the day and the night ozone to have been slightly more in the first quarter of 1889.

Compared with the preceding quarter (October, November and December, 1888), the reports from regular observers show a marked increase of pneumonia, influenza, tonsilitis and bronchitis, and a marked decrease of typhomalarial, remittent, and intermittent fevers, diarrhea, dysentery and cholera morbus in the first quarter of 1889.

### *This Quarter Compared with the Average for Three Years, 1886-1888.*

A comparison of the meteorological conditions of the first quarter of 1889 with the average of corresponding quarters in the three years, 1886-1888, shows that in 1889 the temperature was higher, the absolute humidity slightly more, the relative humidity less, and the day and the night ozone\* were slightly more in the first quarter of 1889.

Compared with the average for the corresponding quarters in the three years, 1886-1888, the reports received from regular observers indicate that intermittent fever, measles, consumption of lungs and neuralgia were less prevalent, and that there was no disease much more than usually prevalent in the first quarter of 1889.

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\* Allowance is made for less sensitive test paper used in the first quarter of 1889 than the average of that used in the corresponding quarters of the preceding three years.

# DEATH OF HOMER O. HITCHCOCK, A. M., M. D., THE FIRST PRESIDENT OF THE MICHIGAN STATE BOARD OF HEALTH.

Upon receipt, at the Office of the Secretary of the State Board of Health, of the sad news of the death of Dr. H. O. Hitchcock, the Secretary sent communications relative thereto to many persons, and one to each member of the Board, of which an abstract is as follows:—

## *Letter from the Secretary of the State Board of Health.*

MICHIGAN STATE BOARD OF HEALTH, }  
OFFICE OF THE SECRETARY,  
Lansing, Michigan, Dec. 8, 1889. }

Member of the State Board of Health,

DEAR DOCTOR:—It becomes my painful duty to announce to the members of this Board the death of Doctor Homer O. Hitchcock, of Kalamazoo, the first President of this Board.

The funeral will occur Monday, December 10, at 2 o'clock. I shall attend.

Dr. H. O. Hitchcock was chosen member of the State Board of Health undoubtedly because of the earnestness and success with which he had worked for the benefit of the public health in the Michigan State Medical Society, as is shown by the transactions of that Society for the few years preceding the organization of the State Board of Health. \* \* \* \* \*

Besides the papers by Dr. Hitchcock mentioned above as having been published in the Annual Reports of this State Board of Health, mention should be made of the important work of Dr. Hitchcock on the Committees of the Board, and in the preparation of circulars and documents issued by the Board during his term of service.

The titles of these papers indicate the practical character of his public-health work; but they do not adequately convey an idea of his conscientious devotion to his work in the Board, which has been held in high esteem by those who were associated with him, and by others.

Very respectfully,

HENRY B. BAKER,  
Secretary.

## *Letter from General Eaton, Ex-United States Commissioner of Education.*

Marietta, Ohio, Nov. 26, 1888.

MY DEAR DR. BAKER:—Your letter telling me the very sad news of Dr. Hitchcock's serious and perhaps fatal sickness was duly received; but many things have delayed the note you desired, for a few days.

Supposing dates, etc., would be in the possession of the family and that only my estimate of him as a teacher was desired, I have so written.

Noble man, I pray that he may be spared, but if taken, we shall deeply feel his loss.

Sincerely yours, etc.,

JOHN EATON.

Dr. Homer O. Hitchcock was senior in Dartmouth College when I was freshman. He graduated in 1851. I was associated with him as assistant teacher for one fall term at Orford, N. H., where he was the very successful Principal of the Academy for several years. I held him in very high esteem. In college he was a courteous, manly, Christian student. His scholarship was excellent. His talent, scholarship and character won the hearty esteem of the faculty. Full of humor, and kindly in his feelings, he was a favorite among the students. He was faithful in the discharge of every duty and especially attentive to all the religious observances in the college.

As principal of the Academy, his noble traits were especially manifest. He was born a teacher and added to his power by careful study. He loved his subjects and was devoted to his pupils. Clear in his own ideas and forcible in his statements, he cultivated in his students alike, power of clear thinking and accurate expression. But however devoted and successful he was in securing mental growth, his great aim was to produce young men and women conducting themselves according to

the Christian standard. His pupils have made their mark and abundantly attested his excellence as a teacher.

His talent, scholarship, industry, Christian character and consecration then, gave promise of the eminence in which he was so long held as a patriotic citizen, a learned, skillful and beloved physician, a benefactor of mankind and devout follower of his Lord and Master.

JOHN EATON.

*Letter from J. T. Reeve, M. D., Secretary of Wisconsin State Board of Health.*

WISCONSIN STATE BOARD OF HEALTH, }  
OFFICE OF THE SECRETARY,  
Appleton, Wisconsin, Dec. 17, 1888. }

MY DEAR DR. BAKER:—I have noticed with much pain the announcement of the death of Dr. Hitchcock, and desire to express my sympathy with his co-workers in the cause of sanitary science and humanity.

The death of such a man is a loss to the world—but he has left an enduring name and fame. The world was richer by his presence and is poorer because of his departure from it.

Sincerely yours,

J. T. REEVE.

The following "obituary," from "The Kalamazoo Daily Telegraph" of December 8, 1888, contains a brief record of the noble character and life-work of the late Doctor Homer O. Hitchcock, A. M., M. D., Kalamazoo, Michigan,—the first-named member and first president of the Michigan State Board of Health:—

# OBITUARY.

HOMER O. HITCHCOCK, M. D.,

was born in Westminster, West Vermont, January 23, 1827, and died in Kalamazoo, Michigan, December 7, 1888. He was the son of Mr. and Mrs. David Hitchcock, who spent the evening of their lives in Kalamazoo, where they made many warm friendships and found a resting place 27 years ago in our beautiful Mountain Home. The family consisted of five daughters and four sons. Dr. Hitchcock was the youngest but one, Mrs. Peyton Ranney, who is the only one of the family now living. His childhood and youth were spent at home on one of the hilly farms of Vermont, in such work and surroundings as are common in the rural regions of New England. The social and religious influences of that home were excellent, and early made an impress on his character which was never lost.

In his youth he began the Christian life, and united with the Congregational church. For about fifty years he had steadily maintained a consistent and earnest character as a Christian, and in the Plymouth church of Kalamazoo during all the time of its existence and for several years in the First church he has been one of the most useful and reliable members. He was ever found on the side of Christian truth and life, and the purest and highest morals. At the bedside of the sick and dying, he was not only "the beloved physician," but often the spiritual counselor and friend. During his course of study at college he had a fervent aspiration to become a minister of the gospel, and only an unfortunate impediment in his speech, which was to him like Paul's "thorn in the flesh," prevented him from choosing that as his life-calling.

Some inward if not divine power impelled him, in spite of many discouragements to leave the farm and its attractions and enter upon a course of study with some useful profession in view. He fitted for college in Kimball Union academy at Meriden, N. H., where he was called to teach one year before his college course was completed. In the class of '51 he graduated with honor at Dartmouth college. It fell to his lot to deliver one of the class orations at commencement. Some of his best friends tried to dissuade him from accepting the appointment. They feared his stammering would cause a failure. But he bravely persisted, as in after life, in performing whatever duty came in his way. His love of speaking and laudable ambition, together with a firm

will, determined him to make the attempt. When he appeared on the platform before a large audience, he looked in the faces of his honored parents and teachers and many sympathizing friends and college-mates, who almost held their breath with fear that he would come to a halt in the midst of his oration. But his courage and unflinching will carried him through triumphantly, and he was greeted with loud applause. After graduating he was elected principal of Orford academy, N. H., where he taught successfully two years. He then fully determined upon the medical profession as the one to which providence had called him. In September, 1856, he was married to Miss Fidelia Wellman of Cornish, N. H., and removed to Kalamazoo, where he began a remarkably successful career as physician and surgeon, lasting thirty-two years, nearly to the close of his life. In 1874 he was afflicted in the loss of his wife by death. She left to him two sons and a daughter, Dr. Charles W. Hitchcock, Albert W., a senior in Yale Divinity school, and Kate W., teacher of French and German in Michigan Seminary at Kalamazoo. He married for his second wife Miss Kate B. Wilcox of Orford, N. H. She and their son, Edward H., are left with the older sons and daughter in deep sorrow and mourning at his death. Once before a very dark cloud rested upon their home, when their dearly loved child Henry was taken from them.

He took great interest in the cause of education, and whatever enterprise promised good to the community. For several years he was an efficient member of the board of education in Kalamazoo, and a trustee of Olivet college. His loss as a citizen and physician, as well as husband, father and friend, will be long and deeply deplored.

Having chosen the practice of medicine as his vocation, he commenced preliminary study under the direction of his brother, the late Dr. Alfred O. Hitchcock, of Fitchburgh, Mass., and subsequently became a pupil of Dr. Peaslee in New York city. He graduated at the College of Physicians and Surgeons in the class of 1854-55. After graduation he availed himself of the opportunities afforded in that city, for more advanced and practical instruction in special branches, more particularly surgery; and, later on, was appointed one of the resident medical officers of Bellevue Hospital. His official connection with this institution brought him into intimate relations with many eminent members of the profession, whose esteem and regard he ever after retained.

He removed to Kalamazoo in the fall of 1856 and at once assumed a leading position in the medical profession; his consultation practice eventually extending far beyond the limits of the city and county. With the exception of a brief term of service as volunteer surgeon in the war of the rebellion, his entire professional life has been spent in Kalamazoo. During the war he was surgeon to the board of enrollment, and for many years he was examining surgeon to the United States pension bureau. Of the local medical and surgical organization he was an active and honored member. His papers and addresses were eminently practical and most carefully prepared; and his discussion of the varied topics under consideration always commanded the interested attention of his associates.

He became a member of the Michigan State Medical Society in 1870, and the high regard in which he was held by the society is evidenced by the honor of an election to its presidency on the following year. His inaugural address on "Modern Medicine: Its Status in Modern Society," was an able and scholarly production. He served upon many important committees of the society, and the character of his published reports and papers attest his marked intellectual ability and his earnest devotion to the advancement of its interests.

Dr. Geo. E. Ranney, the former secretary of the society, referring to Dr. Hitchcock's service as its president, says: "As secretary of the society at that time, I was afforded exceptional opportunities to know him, and to prize the qualities which helped so much to give new life and animation to the society. Though other causes may have co-operated, from the day he became one of its members may be dated a more prosperous career for it; and the year he acted as its president the society enjoyed its largest and most successful meeting up to that time."

He was elected a member of the American Medical Association in 1883 and was frequently appointed a delegate to that body by the Michigan State Medical Society. In 1886 he was appointed a delegate to the British Medical Association, which convened at Brighton, and was elected a member of that association.

Dr. Hitchcock's full recognition of the close relation of hygiene to social advancement and human welfare, and the efficiency of wise legislation in protecting and promoting public health, is indicated by the character of his later productions in the published proceedings of the Michigan State Medical Society. The earnestness and success attending his efforts and investigations in this direction, doubtless influenced Governor Bagley in 1873 to select him as the first appointed member to organize the Michigan State Board of Health. At the first meeting of this efficient and most useful board, he read a paper carefully outlining its work for the future. He was unanimously chosen its first president and continued to hold that important office until

April, 1877. Although again re-elected, he declined, stating "that having held the office since the organization of the board, and feeling that there were other members equally deserving the honor, he respectfully declined to accept the office for another term." He continued, however, to serve actively and most acceptably as a member of the board until July, 1880, when other duties and responsibilities compelled his resignation. In September, 1872, he was elected a member of the American Public Health Association.

With a good physique, fine intellectual endowment, and varied acquirements, he was well equipped for his life work. This brief outline shows how extended and important that work was, and how earnestly, faithfully and beneficently it was performed. Not a single duty neglected; every obligation and responsibility promptly assumed. In professional and official, in fact in all the relations of life, he was thoroughly loyal. Whenever called to act, he sought only to know the right course; this determined, it was at once adopted and diligently pursued without the slightest regard to personal preferment or any other consideration.

The funeral services were held at the family residence of Dr. Hitchcock, in Kalamazoo, Monday, December 10, 1888, and were attended by a large number of prominent physicians throughout the State, who also escorted the remains to their resting place in Mountain Home cemetery.

## EXAMINATION OF PLANS FOR STATE PUBLIC BUILDINGS, DURING THE FISCAL YEAR 1889.

Act No. 206, Laws of 1881, (§ 418, Howell's Annotated Statutes), as amended by Act No. 86, Laws of 1889, is as follows:

Plans for buildings, to whom submitted,

SEC. 7. That before the board of any charitable, penal or reformatory institution shall determine on the plan of any building, or on any system of sewerage, ventilation, or heating, which has been authorized by the legislature to be constructed, such plan shall be submitted to the board of corrections and charities and the State board of health for examination and opinion thereon; and the board so submitting such plan shall, in its biennial report, show to what extent it was approved by the board so examining them. \* \* \* That it shall be the duty of said State boards to visit said penal, charitable and reformatory institutions, when necessary to make the examinations herein required, and their official expenses necessarily incurred shall be audited by the board of State auditors and paid from the general fund.—§ 418.

The following is a report concerning plans for public buildings which were submitted to the State Board of Health for examination, during the fiscal year 1889 :—

### PLANS FOR A PROPOSED COTTAGE FOR CONVALESCENT INSANE, NEAR THE MICHIGAN ASYLUM, AT KALAMAZOO.

At the regular meeting of the State Board of Health, at Lansing, July 10, 1888, the Secretary presented to the Board, for examination, plans for a proposed new cottage for convalescent insane, near the asylum at Kalamazoo, and explanatory letters relative to said plans, which had been received from George Palmer, M. D., medical superintendent of the asylum.

The proposed cottage is designed to accommodate fifty inmates. The plans and letters show that considerable attention has been given to some of the sanitary requirements. However, there were no plans or specifications indicating the nature of the plumbing or house-drainage; there was no explanation of the construction or intended uses of the basement. The plans show no ventilation of bath-room or of the water-closets; but a letter refers to a ventilating pipe from each. The details of the plans were not shown with such definiteness as would enable the Board to express an opinion on many of the points of proposed construction. This was regretted, especially as faulty construction and management of ventilation and house-drainage



have recently been alleged to have caused serious outbreaks of preventable disease and deaths, in two State institutions in Michigan. The sizes of fresh-air inlets are stated in a letter to be four by twelve inches, and the foul-air outlets, four by six inches.\* The Board suggested that they be larger, and specified the area of such inlets and outlets recommended for some of the rooms, as follows: The area of the fresh-air inlets to the dining room should be three square feet clear opening; in the parlor "15 by 21 feet," each of the two registers should have a clear opening of at least 12 by 18 inches; and in the parlor "14 feet 10 inches by 17 feet 10 inches," the fresh-air inlet should be at least one and one-half square feet in area. There seems to be no provision for admitting air not warmed, to mingle with hot air, or to take its place when the hot-air register is closed or partially closed.

The dormitory on the second floor in the annex, is ventilated into the same flue as the room underneath it on the first floor. It should be ventilated into a separate flue.

No ventilation, except a fireplace, was specified for the sitting-room, or for the back dormitory, unless the radiators are "direct-indirect," that is, receive fresh air from out of doors. (Perhaps that is so, and that these are the rooms referred to in the letter from Dr. Palmer.) Unless there is to be an open transom (which is not shown) over the door of the closet adjoining the room, 15 feet 6 inches by 15 feet 6 inches, at the left of the hall in the annex, on the lower floor, there is no ventilation to that room, because the foul-air register is placed in the closet to which there is supposed to be a door usually kept closed.

## SANITARY CONVENTIONS.

Three successful sanitary conventions were held during the fiscal year ending June 30, 1889: One at Hastings, December 3 and 4, 1888, one at Otsego, May 2 and 3, and one at Tecumseh, June 6 and 7, 1889.

### HASTINGS SANITARY CONVENTION.

At the Sanitary Convention held at Hastings, the following program was carried out:

Statement of the Objects of the Convention, by John Avery, M. D., President of the State Board of Health.

President's Address, by Hon. D. R. Cook, of Hastings.

The Degenerations of Age, by Prof. Henry F. Lyster, M. D.

Prevention of Diseases of the Eye and Ear, by G. W. Lowry, M. D.

Discussion.

The Germ Army—How it may be Routed, by A. Arnold Clark.

Plats and Diagrams of Privies and Wells in Hastings, by Irving L. Cressy.

The Water Supply of Hastings, by F. R. Timmerman, M. D.

Discussion.

Disposal of Excreta and Waste in Hastings, by Sewerage and Otherwise, by A. P. Drake, M. D.

Discussion.

Sanitary Ceilings and Walls, by M. B. Church.

Food and its Adulterations, by J. C. Lampman, M. D.

Discussion.

The Prevention of Communicable Diseases, by William H. Young, M. D.

Discussion.

School Hygiene, by Prof. J. W. Roberts.

\* It is probable that this referred only to certain dormitories. But at the time of the meeting of the Board this was not so understood.

Duties of the Local Health Officer, by D. E. Fuller, M. D.

The Duties of the Local Health Officer, by Henry B. Baker, M. D.

#### OTSEGO SANITARY CONVENTION.

At the Sanitary Convention held in Otsego, the following program was carried out:

Address of Welcome, by Hon. W. C. Edsell.

Response, by Hon. John Avery, M. D.

President's Address, by Hon. James M. Bailou.

Ventilation, by Hon. John Avery, M. D.

The Hygiene of Schools, by G. A. Osinga.

Discussion of School Hygiene, by Prof. Delos Fall.

The Causes and Prevention of Consumption, by H. L. Miller, M. D.

The Causes and Prevention of Consumption: Discussion by Henry F. Lyster, M. D.

Disposal of Excreta and Waste in Otsego: Discussion by Arthur Hazlewood, M. D.

Nuisances: What they are and how to Abate them, by A. Arnold Clark.

Discussion.

Present and Future Water-supply of Otsego, by Milton Chase, M. D.

Discussion of the subject of Water-supply.

Restriction and Prevention of Communicable Diseases, from the standpoint of the Local Health Officer, by L. E. Clark, M. D.

The Duties and Compensation of the Local Health Officer, by Henry B. Baker, M. D.

#### TECUMSEH SANITARY CONVENTION.

At the sanitary convention held in Tecumseh, the following program was carried out:—

Address of Welcome, by Geo. Heesen.

Duty of Preventing Disease, by Lemon Barnes, M. D.

Discussion.

The Sewerage and Drainage of Tecumseh, by Geo. S. Tiffany.

Discussion.

The Interest of the State in the Health of the Citizen, by Hon. Cyrus G. Luce, Governor of Michigan.

The Public Press and the Public Health, by C. F. Field.

The Water-supply of Tecumseh, by Hon. Geo. Howell, M. D.

Discussion.

Public Health in Tecumseh, by Samuel Catlin, M. D.

Discussion.

School Hygiene, by Prof. Eugene A. Wilson.

Discussion of School Hygiene.

The Relation of Cess-pools and Privies to Wells, by C. M. Woodward, M. D.

Germ Diseases, by J. F. Jenkins, M. D.

Discussion.

Disposal of Waste and Excreta, by O. Q. Jones, M. D.

The Relation of Climatic Conditions to Disease, by L. G. North, M. D.

The Relations of Climatic Conditions to Disease, discussion by Henry B. Baker, M. D.

The Restriction and Prevention of Dangerous Communicable Diseases from the standpoint of the Local Board of Health, by W. A. Frost, M. D.

Restriction and Prevention of Dangerous Communicable Diseases from the standpoint of the clergyman, by Rev. F. Adkins.

The Restriction and Prevention of Dangerous Communicable Diseases from the standpoint of the citizen, by Daniel T. Hall.

The Restriction and Prevention of Dangerous Communicable Diseases from the standpoint of the State Board of Health, by Henry B. Baker, M. D.

Remarks by D. W. Loree, M. D.

This Seventeenth Annual Report is respectfully submitted.

HENRY B. BAKER,  
*Secretary.*

# PRINCIPAL METEOROLOGICAL CONDITIONS IN MICHIGAN IN 1888.

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A COMPILATION OF REPORTS BY OBSERVERS FOR THE STATE BOARD OF  
HEALTH AND FOR THE UNITED STATES SIGNAL SERVICE.

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COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE STATE  
BOARD OF HEALTH.

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For each of the years 1877 to 1887, inclusive, there has been published in the Annual Reports of this Board a summary relative to the principal meteorological conditions as observed during the year. This paper continues the subject for the year 1888. The names of the observers for 1888 and the months for which copies of their registers of meteorological conditions were received from each are stated in Exhibit 1, page 2. In Exhibit 2, page 3, is given the latitude, longitude, and elevation of each station. In the tables which follow, reports received from any observer for less than half the year have not been used.

The principal conditions treated in the following tables are temperature and humidity of the air, cloudiness, fogs, rainfall, ozone, velocity and direction of the wind, and pressure of the atmosphere. The tables on each subject are illustrated by diagrams representing to the eye variations in the given condition from month to month through the year, at the several localities represented.

These tables give not only meteorological conditions for the year and month under consideration, but they also contain, for purposes of comparison, statements of the average conditions for the longest period available in each case.

In the latter part of the Report for 1886, there was published an article on "The Causation of Pneumonia," in which extensive use was made of meteorological statistics, especially those relating to the meteorology of Michigan. In the report for 1887, in an article on "The Causation of the Cold-weather Diseases," influenza, tonsillitis, bronchitis, scarlet fever, diphtheria, and small-pox are proved to sustain very close relations to meteorological conditions. Extensive use of meteorological and sickness statistics is made in the Report for 1887, in an article entitled "The Relations of Certain Meteorological Conditions to Diseases of the Lungs and Air-passages."

The article in this Report in relation to "Causes of Diseases," based upon weekly reports of sickness in Michigan, may well be studied in connection with this article, the main purpose of which is to serve as a basis for studies of the causes of diseases.

EXHIBIT 1.—Names of observers whose reports are summarized in the following Meteorological Tables and Diagrams, their Places of observation, and the Counties and Geographical Divisions of the State in which these places are situated, and the Months for which reports were received from each observer.

Name of Observer.	Place of Observation.	County.	Divisions of the State.*	Months (inclusive) for which Registers were received.
W. W. Dent, Sergt. Signal Corps, U. S. A.	Marquette.....	Marquette...	U. P.	January to December.
Arthur Beebe.	Gulliver Lake.....	Schoolcraft...	U. P.	January to December.
John J. Stephenson, Sergt. Signal Corps, U. S. A.	Escanaba.....	Delta.....	U. P.	January to March.
F. W. Conrad, Sergt. Signal Corps, U. S. A.	Manistee.....	Manistee.....	N. W.	August to December.
S. E. Wait.	Traverse City.....	G'd Traverse.	N. W.	January to December.
F. B. Millar, Sergt. Signal Corps, U. S. A.	Mackinaw City....	Cheboygan ..	N.	January to March.
James J. Fitz Gerald, Sergt. Signal Corps, U. S. A.	Alpena.....	Alpena.....	N. E.	January to December.
D. W. Mitchell, M. D.	Harrisville.....	Alpena.....	N. E.	January to December.
J. E. Mueller, Sergt. Signal Corps, U. S. A.	Grand Haven.....	Ottawa.....	W.	January to August.
S. L. Doshier, Corp'l Signal Corps, U. S. A.	Grand Haven.....	Ottawa.....	W.	September to October.
Geo. W. Felger, Sergt. Signal Corps, U. S. A.	Grand Haven.....	Ottawa.....	W.	November to December.
John Kimball.	Port Austin.....	Huron.....	B. & E.	January to December.
Wm. M. Edmondson, Sergt. Signal Corps, U. S. A.	Port Huron.....	St. Clair.....	B. & E.	January to July.
H. L. Boyce, Sergt. Signal Corps, U. S. A.	Port Huron.....	St. Clair.....	B. & E.	August to December.
John S. Caulkins, M. D.	Thornville.....	Lapeer.....	B. & E.	January to December.
Prof. R. C. Kedzie.....	Agr'l College.	Ingham.....	C.	January to December.
H. S. Bartholomew.....	Office State B'd of Health, Lansing.	Ingham.....	C.	January to May.
Geo. E. Willitts.....	Office State B'd of Health, Lansing.	Ingham.....	C.	June to December.
G. G. Gordon, M. D.	Swartz Creek.....	Genesee.....	C.	March.
Milton Chase, M. D.	Otsego.....	Allegan.....	S. W.	January to December.
Prof. M. W. Harrington.....	University of Michigan, Ann Arbor.	Washtenaw ..	S. C.	January to December.
J. H. Kellogg, M. D.	Battle Creek.....	Calhoun.....	S. C.	January to December.
Lieut. A. H. Boies.	Hudson.....	Lenawee.....	S. C.	January to December.
Geo. C. Palmer, M. D., Supt. Asylum for Insane.	Kalamazoo.....	Kalamazoo...	S. C.	January to December.
W. T. Drake.....	Marshall.....	Calhoun.....	S. C.	January to September.
Geo. H. Greene.....	Marshall.....	Calhoun.....	S. C.	October to December.
Lewis Marvill.....	Parkville.....	St. Joseph...	S. C.	January to December.
C. E. Beers.....	Tecumseh.....	Lenawee.....	S. C.	January to December.
S. Alexander.	Birmingham.....	Oakland.....	S. E.	January to December.
F. W. Conrad, Sergt. Signal Corps, U. S. A.	Detroit.....	Wayne.....	S. E.	January to March.
D. T. Flannery, U. S. Signal officer.	Detroit.....	Wayne.....	S. E.	April to December.

\*The counties in each Division are Stated in Exhibit I, in the article on weekly reports of sickness.

EXHIBIT 2.—*Latitude and Longitude, Elevation above Sea Level, and the Average Temperature, and Average Barometric Pressure in 1888, at 14 Meteorological Stations in Michigan,—the names of the Stations being arranged in order by latitude, highest first.*

Localities in order of Latitude, those farthest North, first.	Latitude North.	Longitude West from Greenwich.	Altitude (Approximate) above Sea Level,—Feet.	Height of Mercury in Cistern of Barometer above Sea Level,—Feet.	Average Temperature, 1888, Degrees Fahr.	Average Atmospheric Pressure, 1888, Inches of Mercury corrected for Tem.
Marquette.....	46°34'	87°24'	641.42	672	37.00	29.290
Gulliver Lake.....	45°59'	86°1'	627.	631	38.58	29.319
Escanaba.....	45°48'	87°5'	581.	608	-----	-----
Mackinaw City.....	45°47'	84°39'	587.02	605	-----	-----
Alpena.....	45°5'	83°30'	589.	609	39.70	29.367
Traverse City.....	44°45'	85°40'	598.	605	42.60	29.349
Harrisville.....	44°39'	83°18'	616.	620	41.49	29.336
Manistee.....	44°13'	86°16'	600.	615	-----	-----
Port Austin.....	44°	82°	487.	-----	43.73	29.358
Grand Haven.....	43°5'	86°18'	595.3	620	43.38	29.365
Port Huron.....	43°	82°26'	602.	639	43.32	29.370
Swartz Creek.....	42°57'	83°49'	800.	-----	-----	-----
Thornville.....	* 42°55'	* 83°10'	§ 975.	§ 980	45.82	28.964
Agricultural College.....	42°44'	84°29'	820.	834	45.03	29.108
Lansing, S. B. of H.....	† 42°44'	† 84°33'	¶ 900.	¶ 917	45.49	29.092
Birmingham.....	42°30'	83°10'	‡ 752.	-----	45.17	29.134
Detroit.....	42°20'	83°3'	586.	662	45.46	29.348
Battle Creek.....	42°20'	85°11'	-----	-----	48.31	29.127
Ann Arbor.....	42°17'	83°44'	930.	936	45.67	29.019
Marshall.....	42°17'	84°58'	880.	b 883	48.19	29.051
Kalamazoo.....	42°13'	85°33'	944.	955	46.35	29.037
Tecumseh.....	42°1'	83°57'	-----	-----	44.81	-----
Hudson.....	41°53'	84°21'	970.	-----	-----	-----

\* Estimated from lines on a map of Michigan issued by the General Land office, Department of the Interior, 1878. For stations having no reference mark, the latitude and longitude were stated by the observer on the meteorological reports received.

† The exact latitude and longitude of the astronomical post placed in the ground near the new Capitol at Lansing, by the U. S. Lake Survey in 1875, as determined by the observations then made, is 42°43' 53.11" N. and 84°33' 19.68" W.

‡ Estimated from data on "Railroad Profiles," pages 179-187, Annual Report of the State Board of Health for 1878.

§ Estimated from data in Tackabury's Atlas of the State of Michigan.

¶ Estimated from comparisons of barometrical observations at Lansing, Port Huron, and Grand Haven, for the four years, 1879-82.

b 886 in November and December.

NOTE.—Green's standard barometer was used at the above stations for the year 1888, Kalamazoo excepted. The barometer used during January, February and March, 1888, at Kalamazoo, was manufactured by J. Foster, Cincinnati, Ohio.

**EXHIBIT 3.—Statements of Meteorological Conditions in the Year and in each Month of the Year 1888, Compared with Annual and Monthly Averages for 1887, and for several stated Periods of Years—from Observations by Prof. R. C. Kedzie, at the State Agricultural College near Lansing, Michigan.**

Meteorological Conditions.	1888. Compared with Averages for Previous Years.		In 1888  More (+), or Less (-), than in 1887.	Meteorological Conditions.	1888 Compared with Averages for Previous Years.		In 1888  More (+), or Less (-), than in 1887.
	No. of Years Aver- aged, end'g with 1887.	More (+), or Less (-), in 1888 than the Average for Previous Years.			No. of Years Aver- aged, end'g with 1887.	More (+), or Less (-), in 1888 than the Average for Previous Years.	
YEAR 1888.				YEAR 1888.			
Av. Temp.....	24	-1.45°	-1.57°	Continued.			
Range of Temp*...	13	-3°	-13°	Cloudiness.....	24	0	+3 per ct.
Av. Monthly Range of Temp*.....	15	-2°	-3°	Rainfall.....	24	-5.66 in.	-4.54 in.
Av. Daily Range of Temp*.....	14	-1.29°	-2.05°	Atmospheric Pres- sure.....	13	+ .045 in.	+ .016 in.
JANUARY.				FEBRUARY.			
Av. Temp.....	24	-6.12°	-2.80°	Av. Temp.....	24	-1.82°	-2.31°
Range of Temp*...	15	-8°	-20°	Range of Temp*...	15	+4°	+12°
Av. Daily Range of Temp*.....	14	+ .72°	-3 06°	Av. Daily Range of Temp*.....	14	+ .63°	+2.36°
Cloudiness.....	24	+ 4 per ct.	+6 per ct.	Cloudiness.....	24	0	-14 per ct.
Rainfall.....	24	+ .33 in.	-1.07 in.	Rainfall.....	24	-.41 in.	-4.01 in.
Atmospheric Pres- sure.....	13	+ .126 in.	+ .215 in.	Atmospheric Pres- sure.....	13	-.002 in.	-.093 in.
MARCH.				APRIL.			
Av. Temp*.....	24	-3.93°	-1.26°	Av. Temp.....	24	-1.68°	-1.34°
Range of Temp*...	15	+8°	+13°	Range of Temp*...	15	-2°	-2°
Av. Daily Range of Temp*.....	14	-.66°	-1.84°	Av. Daily Range of Temp*.....	14	-.98°	-1.96°
Cloudiness.....	24	0	+8 per ct.	Cloudiness.....	24	-7 per ct.	-9 per ct.
Rainfall.....	24	-.68 in.	+ .10 in.	Rainfall.....	24	-1.26 in.	+ .25 in.
Atmospheric Pres- sure.....	13	+ .137 in.	+ .049 in.	Atmospheric Pres- sure.....	13	+1.80 in.	+ .167 in.
MAY.				JUNE.			
Av. Temp.....	24	-4.70°	-.63°	Av. Temp.....	24	+ .20°	-.64°
Range of Temp*...	15	-2°	+5°	Range of Temp*...	15	+2°	+5°
Av. Daily Range of Temp*.....	14	-5.28°	-6.72°	Av. Daily Range of Temp*.....	14	-2.31°	-1.06°
Cloudiness.....	24	+14 per ct.	+28 per ct.	Cloudiness.....	24	-6 per ct.	-3 per ct.
Rainfall.....	24	+ .58 in.	+1.24 in.	Rainfall.....	24	-1.68 in.	+ .04 in.
Atmospheric Pres- sure.....	13	-.016 in.	-.060 in.	Atmospheric Pres- sure.....	13	-.007 in.	-.062 in.

\* By registering thermometers, set at 7 A. M., and recorded at 7 A. M., for the preceding calendar day.

Comments on Exhibit 3 are printed on page 6.

The low temperature for January and May, the mild weather in December, and the small amount of rainfall for April, June and September are especially noticeable.

EXHIBIT 3.—CONTINUED.—*Meteorological Conditions at the Agricultural College, in Months, for the Year 1888, compared with Averages for Corresponding Months in Preceding Years.*

Meteorological Conditions.	1888 Compared with Averages for Previous Years.			In 1888  More (+), or Less (-), than in 1887.	Meteorological Conditions.	1888 Compared with Averages for Previous Years.			In 1888  More (+), or Less (-), than in 1887.
	No. of Years Aver- aged, end'g with 1887.	More (+), or Less (-), in 1888 than the Average for Previous Years.				No. of Years Aver- aged, end'g with 1887.	More (+), or Less (-), in 1888 than the average for Previous Years.		
JULY.					AUGUST.				
Av. Temp.....	24	-1.11°		-4.98°	Av. Temp.....	24	-1.22°		-.41°
Range of Temp*....	15	-4°		-11°	Range of Temp*....	15	+1°		-7°
Av. Daily Range of Temp*.....	14	-.70°		-1.75°	Av. Daily Range of Temp*.....	14	-.93°		-1.78°
Cloudiness.....	24	-3 per ct.		+7 per ct.	Cloudiness.....	24	-5 per ct.		-6 per ct.
Rainfall.....	24	-.98 in.		+.90 in.	Rainfall.....	24	-.94 in.		+.98 in.
Atmospheric Pres- sure.....	13	+.066 in.		+.028 in.	Atmospheric Pres- sure.....	13	+.032 in.		-.001 in.
SEPTEMBER.					OCTOBER.				
Av. Temp.....	24	-2.53°		-1.10°	Av. Temp.....	24	-2.63°		+.73°
Range of Temp*....	15	0		-6°	Range of Temp*....	15	-10°		-14°
Av. Daily Range of Temp*.....	14	+2.39°		+2.44°	Av. Daily Range of Temp*.....	14	-4.63°		-4.22°
Cloudiness.....	24	-4 per ct.		-3 per ct.	Cloudiness.....	24	+12 per ct.		+10 per ct.
Rainfall.....	24	-1.21 in.		-2.83 in.	Rainfall.....	24	+.42 in.		+1.14 in.
Atmospheric Pres- sure.....	13	+.015 in.		-.059 in.	Atmospheric Pres- sure.....	13	-.062 in.		-.063 in.
NOVEMBER.					DECEMBER.				
Av. Temp.....	24	+3.19°		+2.84°	Av. Temp.....	24	+4.99°		+3.09°
Range of Temp*....	15	+4°		+7°	Range of Temp*....	15	-14°		-16°
Av. Daily Range of Temp*.....	14	-.39°		-1.40°	Av. Daily Range of Temp*.....	14	-3.34°		-5.61°
Cloudiness.....	24	-5 per ct.		+7 per ct.	Cloudiness.....	24	-4 per ct.		-2 per ct.
Rainfall.....	24	+.59 in.		+.84 in.	Rainfall.....	24	-.76 in.		-2.12 in.
Atmospheric Pres- sure.....	13	+.090 in.		+.084 in.	Atmospheric Pres- sure.....	13	-.019 in.		-.013 in.

\* By registering thermometers, set at 7 A. M., and recorded at 7 A. M., for the preceding calendar day.

## METEOROLOGICAL CHARACTERISTICS OF THE YEAR 1888, AT ONE CENTRAL STATION.

At the State Agricultural College, and near Lansing, near the center of the thickly settled part of the State, the average temperature for 1888 was  $1.57^{\circ}$  lower than for 1887, and  $1.45^{\circ}$  lower than the average for the preceding 24 years; the annual range of temperature was  $13^{\circ}$  less than in 1887 and  $3^{\circ}$  less than the annual average range for the preceding 15 years; the average monthly range of temperature was  $3^{\circ}$  less than in 1887 and  $2^{\circ}$  less than the average for the preceding 15 years; the average daily range of temperature was  $2.05^{\circ}$  less than in 1887 and  $1.29^{\circ}$  less than the average for the preceding 14 years; the average cloudiness was 3 per cent greater than in 1887, and the same as the average for the preceding 24 years; the rainfall (rain and melted snow) was 4.54 inches less than in 1887, and 5.66 inches less than the average for the preceding 24 years; the average atmospheric pressure was .016 of an inch greater than in 1887, and .045 of an inch greater than the average for the preceding 13 years.

In Exhibit 3, pages 4 and 5, is given by year and months, a comparison of conditions in 1888, at the Agricultural College, with those in 1887, and with averages for periods of years. December, November and June (naming months in order of greatest difference) were months in which the average temperature in 1888 was higher than average for corresponding months in the preceding 24 years; January, May, March, October, September, February, April, August and July were months in which the average temperature in 1888 was lower than the average for corresponding months in the preceding 24 years, at that station, which is near the central part of the State.

Whoever will carefully study Diagram No. I (p. 18) in this article and in similar articles for preceding years, will see that thermometers and methods of observation have become so perfect that, given a curve representing correctly the temperature by months at one station in Michigan, curves can readily be constructed without actual records which will somewhat closely represent the temperature at each of several other stations, because the curves for many stations run so nearly parallel that all that is necessary to do is to find the average difference of mean annual temperature at the station to be represented compared with the station for which the data are given. It may also be seen that a curve representing the temperature at a station in the central part of the State very closely resembles the curve representing the average for many stations representing nearly all parts of the State. This proves that the practice adopted many years ago of stating the meteorological characteristics at one central station is a reasonably safe practice, and it is especially useful when it enables us to gain a comparison for a longer period than can be made from records at many stations, and also when employed in advance of the receipt of records from all stations, as is the case when the weekly bulletins of "Health in Michigan" are issued, for the purposes, for which the meteorological conditions at the State Capitol are used to represent the conditions probably prevailing throughout the State.

## LOCAL METEOROLOGICAL PHENOMENA IN THE SEVERAL MONTHS OF THE YEAR 1888.

The following general remarks relative to temperature, frosts, effects on vegetation, migration of birds, etc., in 1888, are taken from the monthly reports by observers. The names of observers are stated in Exhibit 1, page 2.



JANUARY.

Light frosts, Jan. 9, 10, 11, 14, 15. Killing frosts, Jan. 16, 20, 21, 30.—*Marquette*.

Frosts, Jan. 2, 3, 5, 11, 21, 23.—*Escanaba*.

Snow on ground at close of month, 25 inches.—*Gulliver Lake*.

Grand Traverse Bay frozen over Jan. 21.—*Traverse City*.

Light frosts, Jan. 2, 5, 8, 9, 10, 11, 15, 16, 18, 20, 21, 24, 27, 28. Heavy frosts, Jan. 21, 22. Ground frozen 21 inches.—*Alpena*.

Eclipse.

The moon was totally eclipsed at 6:00 P. M., Jan. 28. The appearance of the moon during this phase, which lasted until 7:00 P. M., approximately, was of a dull copper color. After 7:00 P. M. the penumbra began passing off. At 7:30 P. M., "approximately," the face of the moon was clear. During the totality the weather was clear and cold.—*Alpena*.

Jan. 26, the most severe storm of the winter; about 3 inches of snow fell; mail train about two hours late.—*Port Austin*.

January was a month of cold weather, the average being about 5° below the normal temperature. There were however but a few days severely cold (4 that the mercury fell below zero), and no great daily range of temperature. There was good sleighing the entire month, the roads not being drifted up as badly as usual. Ice on the ponds is about 13 inches thick—very clear and solid. On account of the bitter wind that attended the cold snap of the 21st some cellars froze, and considerably many potatoes were spoiled. We have missed a January thaw, and the ground is pretty well covered with snow.—*Thornville*.

About  $\frac{1}{2}$  inch of ice formed on walks, trees, etc., Jan. 6. Frosts Jan. 15, 19.—*Lansing*.

Bees were out, Jan. 26, 28, 31.—*Parkville*.

FEBRUARY.

Light frost, Feb. 5, 6, 14, 26. Killing frosts, Feb. 8, 9, 10, 11, 14, 15, 18, 19.—*Marquette*.

Frosts, Feb. 1, 2, 6, 8, 11, 17, 18, 19, 23, 24, 29. Depth of snow on ground at end of month, 8 inches.—*Escanaba*.

Depth of snow on ground, Feb. 18, 33 inches. Phoebe birds seen, Feb. 23. Trees loaded with ice till 9 A. M., Feb. 24. Depth of snow on ground, Feb. 29, 40 inches.—*Gulliver Lake*.

Light frosts, Feb. 1, 8, 9, 10, 11, 13, 15, 24, 27, 28, 29. Heavy frosts, Feb. 22, 24. Melting snow on ground, Feb. 4, 13, 14, 16, 17, 19, 20, 21, 22, 23, 24, 25. Ground frozen about 2 feet.—*Alpena*.

Light frosts, Feb. 18, 22, 23, 24. Killing frost, Feb. 24.—*Grand Haven*.

Nights that did not freeze, Feb. 19, 24, 26, 27. Bees flying, Feb. 25. February was a very dry month, with more sunshiny weather than usual. The mean temperature of the month was considerably (5°) higher than that of January, but the cold waves, worse. One of them, that of the 9th, showing a mean daily temperature lower (12½°) than any observed for several years. The sleighing, inherited from January, went off with a thaw and rain on the 19th, leaving much ice, which lasted the rest of the month. The ice on the ponds at the close of the month is about 20 inches thick; that in the ground is from 0 in the woods to 3 feet in very exposed places. When the snow went off, the wheat was looking as well as could be expected, but may be considerably injured by the sharp freeze which began the night of the 25th—the previous thaw having taken out the frost to the depth of 5 or 6 inches.—*Thornville*.

It has been thawing for several days, with a little rain on the 19th. The snow is nearly gone, Feb. 22.—*Ann Arbor*.

Frosts, Feb. 3, 6, 9, 11, 12, 17, 18, 19, 22, 23, 24. First robin seen, Feb. 12. Snow melting on ground, Feb. 13, 14. First crows seen, Feb. 22. Cedar birds seen, Feb. 29.—*Lansing*.

First appearance of blue birds, Feb. 22 and 23.—*Hudson*.

Spring birds seen, Feb. 24.—*Parkville*.

MARCH.

Light frosts, Mar. 14, 20, 22, 24, 25, 29. Killing frosts, Mar. 13, 17, 23, 24.—*Marquette*.

Frosts, Mar. 4, 7, 8, 13, 14, 17, 23, 24, 25, 28, 29.—*Escanaba*.

A song sparrow seen, Mar. 11. Very clear and frosty, Mar. 3 to 8. A hawk seen, Mar. 13. Very frosty, Mar. 13. First day with average temperature above 32°, Feb. 18. Trees loaded with ice in morning, Mar. 30. Depth of snow on ground at close of month, 35 inches.—*Gulliver Lake*.

Frosts, Mar. 1, 4, 6, 8, 9, 13, 14, 15, 16, 17, 18, 21, 23, 24, 25, 29, 31. Heavy frosts, Mar. 5, 30. Melting snow on ground, Mar. 7, 8, 9, 10, 11, 12, 14, 15, 16, 18, 19, 21, 24, 26, 27, 28, 29, 30, 31. Bay and river frozen over, Mar. 25.—*Alpena*.

Frosts, Mar. 4, 5, 7, 8, 13, 14, 15, 17, 23, 24, 25, 29, 31.—*Grand Haven*.

Robin seen, March 15. Bluebird and Meadow-lark seen, March 19. Snow gone, except drifts along the fences. Five inches snow fell this A. M., March 30. Snow nearly all gone, March 31.—*Port Austin*.

Robins seen, March 1 and 13.—*Ann Arbor*.

Frosts, Mar. 4, 5, 6, 7, 8, 9, 13, 14, 17, 23, 24, 25, 28, 30, 31. Chipping-birds first seen, March 15. Crow, blackbird and meadow-lark seen, March 16. Ice went out of Grand River in the night, March 19. Grand River again frozen over, March 22. Ice again out of Grand River, March 26.—*Lansing*.

Ground, trees and fences covered with ice, March 2; ice dropped, 1:00 P. M. Grass began to grow March 31. Movement of migratory birds:—First robin seen, March 8; first bluebird, March 15; killdeer, March 19; blackbirds, March 20; meadow-lark and song sparrow, March 23; flock of quails, March 30. March was mostly a month of pretty severe winter weather, having had but one night that did not freeze—the 19th. As it closes the frost is still in the ground, except a few inches on the top. During the fore part of the month the ground was partly covered with snow, which gave partial protection to the crops. The tops of the wheat are mostly killed, but it is not yet time to determine how much the roots are hurt. Peach buds are mostly killed.—*Thornville*.

Wild geese, March 10. First frogs, March 31.—*Parkville*.

Frosts, March 3, 4, 5, 6, 7, 8, 9, 12, 14, 17, 22, 23, 24. Robins and bluebirds seen, March 19.—*Swartz Creek*.

Scintillant snow from a clear sky at 7:00 A. M. Crows in the trees this evening—unusual here, March 16. Wild geese flying south this morning, March 18. Wild geese flying east this morning—low down, March 19. Robins chirping in the trees this evening, the first this season, March 30.—*Kalamazoo*.

Numerous spring birds, March 9. Peach buds all dead; wheat very much injured by severe winds and alternate freezing and thawing.—*Birmingham*.

#### APRIL.

Killing frosts, April 4, 8, 20, 21, 22, 24. Light frosts, April 7, 12, 17, 21, 23.—*Marquette*.

Flying squirrels out, April 1. First robins, April 5. Manistique river open, April 5. Lake Michigan and Manistique Harbor open, April 15. First day, average temperature above mean annual temperature. Wild geese flying north, April 27. Cherries and elders sprouting; wild geese flying north, very low, April 28. Snow 16 inches deep in woods; ice six inches thick in Gulliver Lake. April 30.—*Gulliver Lake*.

The ice in Grand Traverse Bay moved out about one mile April 27, but came back April 28. There was about three miles of packed ice cakes to open water, April 30.—*Traverse City*.

Frosts, heavy, April 8, 9, 21. Frosts, April 3, 4, 8, 11, 12, 15, 16, 17, 19, 20, 22.—*Alpena*.

Frosts, killing, April 2, 3, 6, 7, 8, 11. Frosts, light, April 4, 14, 16, 18, 24, 25.—*Grand Haven*.

Crows building nests, April 1. Water 7 inches higher April 2 than on March 1. Ice nearly gone. The weather is fine. The ice is leaving us fast, April 6. Ice boat passed up April 10. A steamer passed up April 13. A large amount of grain sown, April 27. Snow and rain; ground white, April 30.—*Port Austin*.

Frosts, April 3, 6, 7, 8, 9, 12, 13, 15, 17, 18, 21, 22, 23, 24, 25.—*Port Huron*.

Sleet and hail, April 17. Heavy snow storm, April 14; mostly melting as it fell—ground covered 1 inch deep next morning. Light snow, April 19. Nights that did not freeze, April 13, 26, 27, 28. Arrival of migratory birds: Black cap fly catcher, April 4; chewink, April 7; kingbird, April 25; oriole, April 27; whippoorwill, April 28. Frogs first heard April 3. A dry, cold month; bad for wheat and grass, which are small. Ice formed every night more or less, except on those of the 16th, and the three hot days of the last week. As the month closes there is yet ice in the ground in some places, such as the north side of fences and stumps. The dry days and freezing nights have been extremely unfavorable for the growth of wheat and grass, which are small. The outlook for much of a crop of wheat is poor.—*Thornville*.

Frosts, April 1, 2, 3, 4, 6, 11, 12, 13, 14, 20, 24. Frogs first heard and wild geese seen flying north, April 1. Currant bushes in leaf; bobolink first heard, April 28. Lilacs in leaf; bees gathering honey from willows and maples; red bird seen, April 27.—*Lansing*.

Toads chirping—first time noticed this spring—April 26.—*Ann Arbor*.

Robins, blackbirds, song sparrows, phoebe-birds, bluebirds and meadow-larks observed April 1.—*Hudson*.

Orioles, first heard this season, April 29.—*Kalamazoo*.

Barn swallows seen April 25.—*Parkville*.

Hard freeze and heavy frosts, April 8, 9, 13. Ground frozen, no frost, April 17. Ground frozen, April 20, 21. Slight flurries of snow, April 20. Ground considerably frozen mornings of April 23, 24. Hard freeze, April 25, 26. Frost, April 26. Season very backward; but little growth of grass up to date, May 1. Wheat generally looking bad. Willows, hepaticas and sanguinaria just blooming—four weeks later than usual. Farm work generally backward.—*Birmingham*.

#### MAY.

Frosts, killing, May 1, 2. Frosts, light, May 1, 8, 17.—*Marquette*.

Snow 2 feet deep in swamps, May 1. Frosts, May 1, 2, 6, 8, 14, 15, 16, 20, 30. Wild geese flying north very low, May 3, 4, 5, 6. Ice broke up in Gulliver lake, May 10. Ground covered with snow in morning, May 15. Snow storm, melted as it fell, May 18. Birch and maple buds partially open, May 31.—*Gulliver Lake*.

Melting snow on ground, May 1, 2, 3, 14, 15. Light frosts, May 2, 6, 16, 17, 20, 30.—*Alpena*.

Frosts, killing, May 1, 2, 15, 16, 20. Mirage, May 6. The mean temperature ranged generally below normal, which was especially marked during the middle of the month, retarding the season and growth of vegetation generally throughout this section. The precipitation, although slightly below normal for the month, was comparatively well distributed as to time and amounts, which proved to be of great benefit to the crops and cereals; in general, which had suffered considerably by the late killing frosts. Fruit trees generally are reported as promising of full crops.—*Grand Haven*.

Ground white with snow at 7 A. M. May 1. Snow flurries, May 12, 13, 14. Strawberries, plums and cherries in blossom. Apples beginning to blossom, May 24.—*Port Austin*.

Nights that froze, May 1, 2, 3, 13, 15. Snow flakes flying by turns all day, May 13, 14. Unusual heavy rainfall, .46 of an inch in about 15 minutes, May 28. First grasshopper seen, May 2. Tamarack and willow leafing, May 8. Apple and white thorn leafing, May 10. Maple and elm leafing, May 17. Yellow oak leafing, May 21. Red oak leafing, May 23. White oak leafing, May 26. Locust leafing May 27. Juneberry in blossom, May 14. Plum and cherry in blossom, May 20. Apple in blossom, May 23. Mandrakes come up, May 22. Yellow birds return, May 1. Catbirds return, May 2. Bobolinks return, May 9, and cuckoo, May 17. May was a cold month, having had but one day with a maximum temperature of 80° or above and 9 nights with a minimum of 40° or below. Vegetation is backward and slow of growth. Wheat and grass are very poor and the season is too far advanced for very much improvement in them. The prospect for other crops is not cheering, but if summer weather comes soon, they may do fairly well yet.—*Thornville*.

Frosts, May 2, 14, 20. Ice formed one-fourth inch thick, May 15. In bloom: Dandelions, May 9; sweet cherry trees, May 10; peach and pear trees, May 11. Orioles arrived, May 9. Mowing of capitol lawn commenced, May 9.—*Lansing*.

Frost, night of May 1.—*Ann Arbor*.

Heavy frost and ice formed in nights of May 1, 14, 15. Hailstorm and light snow, A. M. of May 14.—*Hudson*.

Ice formed, May 2, 16. Frost, May 20.—*Parkville*.

Heavy frost, ground frozen, considerable ice on ponds, May 2. Slight snow at 8 A. M., May 13. Light snow flurries during day, May 14. Light frost, frozen ground, and some ice in morning, May 16, 17, 20.—*Birmingham*.

#### JUNE.

Frosts, light, June 2, 7, 11. In leaf: Birch, June 3. Maple, June 9. Strawberries in blossom, June 18.—*Gulliver Lake*.

Frosts, June 1, 2. Mirage, June 2.—*Traverse City*.

Frosts, light, June 2, 11.—*Grand Haven*.

Frosts, slight, in places, June 1. The month is very dry; crops suffering.—*Port Austin*.

Wheat headed out, June 6. June clover blossoms, June 11. Locust in bloom, June 16. June was notable for a week of hot weather, with a mean temperature higher than often observed. The conditions of the month have been quite favorable for the development of what clover and wheat the winter had left. Unless rust strikes the wheat it will do better than seemed at one time possible. Oats will do well unless drought sets in. So will corn and potatoes, which though small are growing rapidly. Apples promise well, contrary to expectation; there will be few cherries.—*Thornville*.

Frost, morning, June 3.—*Hudson*.

Frost, June 3.—*Parkville*.

Frosts, light, on low grounds, June 1, 3.—*Birmingham*.

## JULY.

There has been but very little rain during the month; crops are suffering for water. Many showers have passed north and south without giving us any rain.—*Port Austin*.

Wheat harvest began July 20. July was a month of dry, hot weather. The drought during the latter part of the month was hurtful to corn, potatoes, clover seeding and pastures. The wheat proved to be better than was at one time to be expected. Oat harvest is beginning on the last of the month; the crop is immense but quite smutty. Except where cultivation has retained surface moisture the ground is dried out from three to three and a half feet.—*Thornville*.

The rain storm of July 31 did an incalculable amount of good. Potatoes, corn and grass were drying up very fast, and little butter made during July. Late potatoes and corn are benefited greatly by the rain, and a fairly good crop may be looked for.—*Hudson*.

## AUGUST.

*Tornado.*

A tornado crossed section 9, T. 41 N., R. 15 W., August 8, approaching from Lake Michigan; width from 100 to 200 feet; course about N. 25° E., but zigzag. Direction of rotation was against the sun. It made a clean sweep of timber in its path, but rose from the ground at one point for about 80 rods. It lasted about 15 minutes. It had the appearance of a column of smoke. It carried a large tamarack tree up a bluff 80 feet high, and 40 rods beyond, and a large birch tree, with the roots on, about 15 rods.—*Gulliver Lake*.

Damaging frosts have been reported as having occurred August 22 and 23 at Jamestown, Hudsonville, Zeeland, and the southern portion of Allegan county.—*Grand Haven*.

August was a month of worse drought than July. There was but little very hot weather, and the nights were mostly cool—circumstances that made the dry weather more endurable both for crops and stock. Wheat proved to be considerably better than was at one time to be expected. Oat harvest commenced with the close of the month, the crop is immense, but smutty. Water is very low—all swamps and cat-holes are dry. Wells are failing and some springs are going dry. Where surface moisture has not been retained by frequent cultivation the ground is as dry as ashes four feet or more.—*Thornville*.

Light frosts reported to have occurred August 21 and 22, in low places, in the vicinity of the station, without damage to growing crops. None observed at the station.—*Lansing*.

A few light frosts noticed on low ground near the end of the month.—*Ann Arbor*.

Light frosts mornings of Aug. 10, 13, 22. No damage done to crops.—*Hudson*.

Excessive drought has prevailed during nearly the entire month.—*Birmingham*.

Frosts, light, Aug. 23, 24, 28.—*Detroit*.

## SEPTEMBER.

Frosts, light, Sept. 1, 13, 29. Forest fires in all directions, Sept. 3. Leaves of forest trees commence to turn brown, Sept. 9. Lowest water, Sept. 15, in Gulliver lake, 21 inches below high water of May 15. Maple leaves falling, Sept. 30.—*Gulliver Lake*.

Frost, light, Sept. 1; first of season. Frosts, light, Sept. 13, 14.—*Manistee*.

Frosts, Sept. 4, 10.—*Traverse City*.

Frosts, light, formed Sept. 1, 5, 6, 28. Heavy frosts, formed Sept. 13, 29. Potatoes and other vegetation injured by frost.—*Alpena*.

Frosts, Sept. 5, 27.—*Lansing*.

Frosts, killing, Sept. 13, 14, 29. Frosts, light, Sept. 1, 5.—*Grand Haven*.

Frost, light, on low ground, Sept. 6.—*Port Austin*.

Frost, heavy, Sept. 5: killed some corn and buckwheat. Frosts, light, Sept. 6, 13, 14; doing little damage. Frosts, heavy, Sept. 28, 29; killed nothing on account of wind blowing. Very few birds have been seen since the first of the month. It would seem they have left without assembling in flocks as they usually do. September was a dry, cool month. Wheat sowing was late on account of drought, and the plant is very small yet. There is need of warm weather if it gets top enough to winter. Except where the ground is cultivated it is completely dry for three or four feet down.—*Thornville*.

Frosts, Sept. 14, 15.—*Ann Arbor*.

About six miles north of this station snow fell on the afternoon of Sept. 28 enough to make snow-balls.—*Hudson*.

Frost, heavy, Sept. 12. Frost, Sept. 13.—*Marshall*.

Frost, Sept. 2. First ice, Sept. 13.—*Parkville*.

The drought of July and August continued during this month; the few light rains that we have had doing but little good. Plowing and sowing wheat continues until the last of the month. The month has generally been disagreeably cool, notwithstanding which fact a great many spring song birds have put in an appearance.—*Birmingham*.

Frost, killing, Sept. 29. Light frosts, Sept. 13, 14, 28.—*Detroit*.

#### OCTOBER.

Frosts, Oct. 4, 5, 9, 12, 13, 18, 19, 20, 21, 24, 30. First ice, one-fourth inch thick in copper boiler, Oct. 9. Wild geese, south in morning, Oct. 19. First snow storm, Oct. 22.—*Gulliver Lake*.

Frosts, killing, first of season, Oct. 6 and 10. Frosts, light, Oct. 11, 29. Light snow, first of season, Oct. 2. Ice formed one-eighth of an inch thick, first of season, Oct. 10.—*Manistee*.

White frost, Oct. 9. Wild geese flying south, Oct. 28.—*Traverse City*.

Frosts, Oct. 6, 9, 15, 18, 22, 23, 30. Frosts, heavy, Oct. 10, 11. Melting snow on ground, Oct. 2, 3, 20, 21.—*Alpena*.

Frosts, killing, Oct. 6, 9, 10, 30.—*Grand Haven*.

Frosts, killing, Oct. 18, 30. Light frosts, Oct. 3, 9, 10, 11, 28.—*Port Huron*.

Nights that froze, Oct. 2, 8, 9, 10, 15, 17, 19, 20, 21, 23, 24, 29. First snowflakes, Oct. 2, 3. Cat birds seen, Oct. 3. Meadow-larks seen, Oct. 22. Small flock of robins seen, Oct. 29. Wild geese first heard, Oct. 20. Apples secured; crop fair in quantity, but very wormy; corn, half cribbed or more; wheat, small; clover, very small. The month has been cool, 2 or 3 degrees below the normal, which, with the quite insufficient rainfall, accounts for the poor condition of the growing crops.—*Thornville*.

Frosts, heavy, Oct. 9, 10. Frosts, Oct. 17, 25, 28, 30. Wild geese flying southwest, Oct. 20.—*Lansing*.

Frosts, heavy, Oct. 9, 10. Slight snow, Oct. 20, 22.—*Ann Arbor*.

Frosts, heavy, Oct. 4, 24, 25, 30. Ice formed one-eighth of an inch thick Oct. 4, 21, 23, and one-fourth of an inch thick Oct. 30. First snow of season, Oct. 22. Wild geese flying south, Oct. 17.—*Hudson*.

Swans flying south, Oct. 21.—*Kalamazoo*.

Wild geese, Oct. 21.—*Parkville*.

The latter part of the month (October) was very pleasant. The late rains have broken the drought, and wheat and pasturage have made good growth. Song birds have continued with us, and there has been more entomological life during this month than during June last.—*Birmingham*.

First snow of season, Oct. 19. Frosts, killing, Oct. 3, 9, 10, 11, 30. Light frosts, Oct. 4, 12, 18. Air filled with seed-down from the cottonwood tree of this vicinity, Oct. 31.—*Detroit*.

#### NOVEMBER.

First snow of season deep enough to measure, Nov. 10. First day average temperature below 32°, Nov. 15. First day maximum temperature below 32°; first ice in Gulliver Lake, Nov. 17. Gulliver Lake frozen solid, Nov. 20. Snow on ground one-half inch. Ice on Gulliver Lake one-half inch, Nov. 30.—*Gulliver Lake*.

White frost, Nov. 2, 7.—*Traverse City*.

Heavy frost, night, Nov. 7. Melting snow on ground, Nov. 10, 11, 15, 18, 19, 21, 24, 25, 26. Ground frozen about one-half inch.—*Alpena*.

Clear days on which rain or snow fell, 0. Clear days on which none fell, 8. Fair days on which rain or snow fell, 2. Fair days on which none fell, 7. Cloudy days on which rain or snow fell, 10. Cloudy days on which none fell, 3.—*Grand Haven*.

Trees loaded with frost work, Nov. 22. November was a pleasant month for the season, with a mean temperature rather above the normal. Nearly the whole of it, and especially the first half, was favorable for the growth of the wheat, much of which is late sowed. Some corn still remains out as the month ends. There is about three inches frost in the ground when plowed—very little under the sod. There was no snow that stayed.—*Thornville*.

Frosts, Nov. 7, 12, 21, 22. Ice formed, Nov. 7. First snow of the season, Nov. 10. Grand river frozen over in places, first time of the season, Nov. 21.—*Lansing*.

Frosts, Nov. 4, 5, 6. There was no snow on the ground Nov. 15, and the light fall of Nov. 18 has all disappeared at the close of the month. Wheat generally is looking well, the freezing not having been severe enough to do damage; ground is fairly moist at this date, but would take considerable more rain.—*Hudson*.

Frosts, Nov. 4, 7, 11, 12. Ground frozen, Nov. 12, 11. Slight snow, Nov. 15.

The first half of November was very pleasant, snakes and insects were moving about as late as

Nov. 15. Song birds were present as late as Nov. 30. Wheat grew more during this month than it did during October.—*Birmingham*.

Frosts, killing, Nov. 7, 12, 16. Light frost, Nov. 13. Wild geese flying southwest to northeast, Nov. 2.—*Detroit*.

#### DECEMBER.

Ground bare. Frost out of ground. Water over ice on Gulliver Lake, Dec. 24. First sleighing, Dec. 27. Snow on ground, 7 inches; ice on Gulliver Lake, 6 inches. No ice had formed on Lake Michigan at close of month.—*Gulliver Lake*.

One-half inch of snow on ground, Dec. 31.—*Traverse City*.

Melting snow on ground, Dec. 1, 4, 7, 9, 10, 15, 16, 27, 30, 31. Navigation closed Dec. 21. Bay and river frozen over. The last boat of season, scow Garribaldi, laden with lumber for New Baltimore, left this port at 3:00 A. M., Dec. 2. The ground is frozen about six inches. Floating ice in bay and river Dec. 31.—*Alpena*.

Clear days on which rain fell, 0. Clear days on which no rain fell, 1. Fair days on which rain fell, 1. Fair days on which no rain fell, 10. Cloudy days on which rain fell, 8. Cloudy days on which no rain fell, 11. Melting snow on ground, Dec. 30. Mildest December since 1881.—*Grand Haven*.

A sail went east Dec. 12. The first appearance of slush ice; a vessel passed down, Dec. 13. The light-house closed Dec. 14. A steamboat passed down Dec. 19. Christmas was cloudy, but very pleasant. About  $\frac{1}{4}$  inch of snow on ground, Dec. 21. We have had not to exceed two inches of snow all told.—*Port Austin*.

Black River frozen over, first time this winter, Dec. 21.—*Port Huron*.

Nights that did not freeze, December 24, 25. December was dry and unusually mild for the season, with small range of temperature, and mean of about 5° above the normal. There was no sleighing and no snow on the ground at the close. Frost in the ground about six inches in the open. There is need of more rain before winter fairly sets in, swamps and marshes being all dry.—*Thornville*.

Frosts, December 13, 30. Grand River frozen over, December 12.—*Lansing*.

No snow on ground in this section December 15, and ground frozen only about four inches which was all taken out by a rain the next day. No snow on ground December 31, and ground frozen from four to six inches. The wheat is not materially damaged so far, but should such weather as the past month continue, much damage may occur to it. No marked features have occurred during the month except the absence of snow. Storms have not been severe.—*Hudson*.

December has not seemed like a winter month. It has been pleasanter than has the month of April for the past few years. The ground has been frozen but little, and has entirely thawed out several times. On Christmas day people were comfortable without fire in their houses, a thing which has not been since the Christmas of 1874.—*Birmingham*.

#### METEORS.

Feb. 28, 8:47 P. M., 1 meteor, large, white, course S. E. to N. W.; March 6, 8:35 P. M., course E. to N. W., high up; March 8, 1:12 A. M., course S. to N.; April 19, 1:20 A. M., course E. to W.; June 8, 9:15 P. M., course from under Jupiter to S. W.; June 15, 9:10 P. M., course from under Jupiter to S. W.; July 1, 8:45 P. M., course from under *g* Ursa Major to N. W.; July 3, 1:15 A. M., 2 meteors, course zenith to S.; 1:20 A. M., 1 meteor, course zenith to W.; 1:20 A. M., course zenith to N.; July 6, 2:25 A. M., course from under Arcturus to S.; July 10, 11:00 P. M., course zenith to S.; July 11, 12:10 A. M., course zenith to E.; July 18, 1:15 A. M., course Arcturus to S. W.; 1:20 A. M., course Arcturus to S. W.; July 22, 9:10 P. M., course *b* Pegasus to N. E.; 9:15 P. M., course *b* Pegasus to N. E.; 9:30 P. M., course Antares to S. W.; July 23, 12:25 A. M., course S. to S. W.; July 24, 9:15 P. M., course Arcturus to W.; July 26, 9:10 P. M., course Arcturus to S. W.; July 29, 2:10 A. M., course S. to N.; July 29, 8:30 P. M., in S. W., "came straight down;" August 1, 8:00 P. M., course from Altair to N. E.; 8:10 P. M., course *a* Cygnus to S. W.; August 2, 1:00 A. M., course N. to S.; August 3, 12:05 A. M., course E. to W.; 1:05 A. M., course N. to S.; 1:10 A. M., course S. to N.; 1:20 A. M., course E. to N. W.; 1:20 A. M., course straight down; 2:30 A. M., course E. to N. W.; August 4, 9:50 P. M., course *a* Pegasus to E.; August 5, 1:00 A. M., course S. to N. W.; August 6, 12:05 A. M., course S. to N.; 12:10 A. M., course E. to W.; 9:30 P. M. to 9:45 P. M., course *g* Pegasus to N. E.; 3 meteors, course the Square of Pegasus to S. E.; 1 meteor, course W. to E. across *a* Perseus; 1 meteor, course Pointers to E.; 1 meteor, course Perseus to N.; 1 meteor, course Perseus straight up; August 10, 12:10 A. M., 2 meteors, course N. to S.; 12:15 A. M., 1 meteor, course E. to W.; August 11, 12:00 night, course E. to S. W.; August 12, 8:10 P. M., course N. to W., low down; August 13, 12:15 A. M., course N. to S.; August 14, 3:10 A. M., course E. to

w.; August 15, 3:10 A. M., course w. to s. e.; August 23, 7:45 P. M., course Altair to n. e.; 7:50 P. M., course *b* Pegasus to n. e.; 8:10 P. M., 1 red meteor, course from the Square of Pegasus to e.; 8:20 P. M., course Corona to w.; August 24, 9:10 P. M., course the Square of Pegasus to e.; August 25, 8:20 P. M., course *a* Andromeda to n. e.; 8:45 P. M., course Cor. Caroli, s. across Arcturus; 9:00 P. M., course Dolphin to s.; August 30, 8:10 P. M., course *a* Andromeda to s. e.; Sept. 1, 8:00 P. M., course e. to w. across Vega; 8:12 P. M., course e. to w. across Altair; 8:15 P. M., course n. to s. across Scorpio; 8:15 P. M., course e. to w. across Sagittarius; Sept. 2, 8:15 P. M., course Dolphin to n. e.; Sept. 4, 8:50 P. M., course n. to s. w.; 10:00 P. M., course n. to s.; Sept. 7, 12:10 A. M., course e. to w.; 8:55 P. M., course e. to s. w.; Sept. 8, 12:10 A. M., course straight down; Sept. 9, 8:05 P. M., course Dolphin to w.; 8:30 P. M., course s. to n. across Deneb; Sept. 24, 7:25 P. M., course Cepheus to w.; Oct. 4, 8:50 P. M., course e. to n. w.; Oct. 27, course zenith to s. e.; Oct. 29, 6:20 P. M., under Polaris to n.; 8:50 P. M., course e. to w.; Nov. 13, 1:10 A. M., 1 meteor, course s. to n., and 1 meteor, course e. to w.—*Kalamazoo*.

\* Dec. 2, 10:30 P. M., large, brilliant meteor, south, moving to west toward the earth.—*Lansing*.

#### MEASUREMENTS AND TEMPERATURE OF GROUND WATER.

In a paper entitled "Typhoid Fever and Low Water in Wells," on pages 89-114 of the Report of this board for 1884, it is shown that for the years 1878-82 there was a relation between the sickness and deaths from typhoid fever in Michigan and the depth of water in wells. In the month of October, when the water in wells reached the lowest point in the year, there were the most deaths and sickness from typhoid fever; and following the month of April, when the water in wells was highest, there were the least deaths and sickness from typhoid fever. When this comparison is made in a diagram, it is found that, "beginning with June in each year the curve representing sickness from typhoid fever follows more or less closely the curve representing the average depth of earth above the ground water."

Typhoid fever being one of the most important causes of deaths in Michigan, it is of very great importance that further evidence be collected on this important subject.

The measurements for each month in 1888, of the depth of wells at eight places in Michigan, are shown in Exhibit 4; also the depth of earth above water in wells and temperature of water in wells. It is hoped these measurements and observations may continue, and permit a more extended comparison of the depth of water in wells with the sickness from typhoid fever, and with sickness and death from other diseases.

#### CHANGE OF EXPOSURE OF INSTRUMENTS AT LANSING IN 1884.

Comments on the subject of a new instrument shelter at Lansing are printed on page 21, Report for 1885. Exhibits A, B, C, and D, pages 22 and 23, of the Report for 1886, relate to that subject, and may be studied in connection with what is said on page 21, Report for 1885. The fact of the change of place of observation in 1884 may need to be taken into account by whoever studies the meteorology at Lansing through a long series of years.

EXHIBIT No. 4.—Depth of Wells: Depth of Ground above Water in Well; Temperature of Water in Well, and day of observation of such temperature, in each month of the year 1888, as reported by Meteorological Observers for the State Board of Health, and for the United States Signal Service.

Stations in Michigan.	January.			February.			March.			April.			May.			June.		
	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.
Traverse City*	55	38 2	34	55	37 10	28	55	38	31	55	37 2	33	55	37	34	37 2	47	25
Alpena.....	8	6 7	17	8	7	18	8	7 2	17	8	7	16	8	6 8	16	7 3	70	16
Lansing.....	26 11½	24 4½	16	26 11½	24 10½	16	26 11½	24 5½	19	26 11½	24 4½	16	26 11½	24 5	16	24 5	48	16
Ann Arbor.....	15	13 10	16	15	13 9¾	15	15	13 5	16	15	11 10	18	15	12 9	16	13 4	47.3	15
Battle Creek.....	52 4	47	15	52 4	47	15	52 4	47	16	52 4	47	16	52 4	47	15	47	54	15
Kalamazoo (Asylum).....	25	10	15	25	10	15	25	10	16	25	10	16	25	15	15	15	48	15
Otsego.....	14 6	10 6	17	14 6	12 3	16	14 6	12 2	17	14 6	10 2	16	14 6	10 5	15	14 6	10 3	15
River Raisint.....	23	17 6	16	23	17 6	15	23	17	16	23	17	16	23	17	15	16	48	15
Hillsdale.....	30	24 5	49	30	25	46	30	21 3	.....	30	20 5	46	30	21 7	48	22 5	49	15

NOTE.—The small figures above and at the right of the numbers denoting the degrees of temperature, state the day of the month on which the observation was made.

\* At Northern Michigan Asylum, W. H. Bauld, observer.

+ D. W. Palmer, observer.



## EXHIBIT 4.—CONTINUED.

Stations in Michigan.	July.			August.			September.			October.			November.			December.		
	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.
Traverse City*	55	36 10	46 <sup>16</sup>	55	36 7	47 <sup>24</sup>	55	37 2	47 <sup>22</sup>	55	37 6	47 <sup>22</sup>	55	38	47 <sup>23</sup>	55	37 7	47 <sup>23</sup>
Alpena.....	8	7 4	56 <sup>16</sup>	8	7 2	50 <sup>14</sup>	8	7 3	35 <sup>15</sup>	8	7	36 <sup>16</sup>	8	7 4	30 <sup>15</sup>	8	7	31.3 <sup>11</sup>
Lansing.....	26 11½	24 5¼	47 <sup>16</sup>	26 11½	24 2¼	50 <sup>16</sup>	26 11½	24 5	51 <sup>16</sup>	26 11½	24 9	51 <sup>16</sup>	26 11½	24 5½	52 <sup>17</sup>	26 11½	25	51 <sup>11</sup>
Ann Arbor.....	15	13 10	51 <sup>15</sup>	15	14 0¾	53 <sup>17</sup>	15	14 1¾	53.5 <sup>7</sup>	15	14 6½	51.5 <sup>17</sup>	15	14 6½	47.5 <sup>20</sup>	15	14 6½	43 <sup>22</sup>
Battle Creek.....	52 4	47	54 <sup>31</sup>	52 4	47	54 <sup>18</sup>	52 4	45 9	45 9	52 4	50 9¾	51 <sup>15</sup>	52 4	50 6	54 <sup>15</sup>	52 4	50 4	53 <sup>15</sup>
Kalamazoo (Asylum).....	25	15	49 <sup>16</sup>	25	15	48 <sup>16</sup>	25	15	51 <sup>16</sup>	25	15	51 <sup>16</sup>	25	15	50 <sup>15</sup>	25	15	48 <sup>15</sup>
Oshtemo.....	14 6	9 10	16 <sup>16</sup>	14 6	11 8	17 <sup>17</sup>	14 6	13 1	15 <sup>15</sup>	14 6	13 4	15 <sup>15</sup>	14 6	13 4	15 <sup>15</sup>	14 6	13 6	14 <sup>14</sup>
River Raisint.....	23	16	48 <sup>15</sup>	23	17 6	50 <sup>15</sup>	23	17	50 <sup>15</sup>	23	16 6	50 <sup>15</sup>	23	16	50 <sup>15</sup>	23	17	44 <sup>15</sup>
Hillsdale.....	30	23 6	49	30	24 4	50	30	25 4	50	30	26 6	50	32	28 3	50	32	27 2	50

NOTE.—The small figures above and at the right of the numbers denoting the degrees of temperature, state the day of the month on which the observation was made.

\* At Northern Michigan Asylum, W. H. Bauld, Observer.

+ D. W. Palmer, Observer.

+ Observation made Oct. 7, 1888.

## TEMPERATURE.

Compared with the average for the preceding 24 years at the Agricultural College, the mean temperature for January and May was low. A comparison, by months, of temperature in 1888, with the averages for corresponding months in the preceding 24 years, 1864–87, at the Agricultural College, near Lansing, is given in Exhibit 6, page 22.

The average temperature, by months, for the nine years, 1879–87, at Lansing, and a comparison of 1888, by months, with that average, are stated in Exhibit 7, page 22.

The average annual and monthly temperature at from 12 to 22 stations for a period of 11 years, 1877–87, is stated in Exhibit 5, page 17, in which is also given, by months, a comparison of 1888 with the average for 1887, and with the averages for the 11 years, 1877–87. By Exhibit 5, page 17, which gives averages for groups of several stations in Michigan, it appears that in 1888 the mean temperature in January, May and July was lower than in those months in 1887. It also appears that January, March, May, September and October were much colder than the average temperature of the corresponding months for the 11 years 1877–87, and June, November and December were warmer than the average temperature of the corresponding months for those years.

By Exhibit 10, page 26, it appears that, at the Agricultural College, the lowest temperature reached in January and February, 1888 was considerably below the average lowest temperature for the corresponding months in the preceding 15 years, and that in the month of January, 1888, the range of temperature was considerably less than the average range of temperature for the corresponding month in the 15 preceding years, and also the highest temperature for 1888 was below the average highest temperature for the preceding 15 years, and the lowest temperature was the same as the average lowest temperature for those years. The highest and lowest temperatures at the Agricultural College, in every month of the 16 years, 1873–88, and comparisons of months in 1888, with the average highest and lowest temperatures by months for the preceding 15 years, are stated in Exhibit 10.

The average temperatures at each of 18 stations in Michigan, and the average for 13 stations and for 5 stations in 1888, and in each month of that year, are stated in Table I., page 19; 8 of the lines in this table are represented in Diagram I., page 18.

The average daily range of temperature at from 6 to 18 stations per year, by months, for a period of 9 years, 1879–87, and a comparison of 1888, with the monthly averages for that period and for 1887, are given in Exhibit 8, page 23. The highest and lowest temperatures in every month in 1888, at each of 16 stations, are stated in Table II., pages 20 and 21. The average daily range of temperature by months in 1888, at each of 15 stations, and the average for the 15 stations, are stated in Table III., page 25. The lines for 10 of these stations, and the average line for the 15 stations, are represented in Diagram II., page 24. It will be noticed that the greatest average daily range occurred during the months of June, July, August and September.

EXHIBIT 5—Average Temperature by Year and Months, in 1888,\* compared with Annual and Monthly Averages for 1887, and for the Eleven Years, 1877-1887. These Averages are for Groups of Several Stations in Michigan.

Years, etc.	Average Temperature—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 11 years, 1877-87	45.99	20.20	23.43	29.41	44.12	56.50	65.23	70.77	67.98	61.33	50.25	35.96	26.69
Av. 9 years, 1879-87.	45.33	19.54	21.75	28.46	42.93	56.50	64.98	70.16	66.26	60.76	49.99	35.51	26.01
1887 (17 stations)....	44.82	16.58	21.57	25.55	42.09	60.68	66.53	73.22	66.41	57.95	44.46	35.18	27.57
1888 (13 stations)....	45.03	15.93	21.65	25.89	42.81	53.40	68.03	70.95	68.05	58.20	46.01	38.73	30.73
In 1888 <b>Higher</b> than Av. for 11 years, 1877-87.....	-----	-----	-----	-----	-----	-----	2.80	0.18	0.07	-----	-----	2.77	4.04
In 1888 <b>Lower</b> than Av. for 11 years, 1877-87.....	0.96	4.27	1.78	3.52	1.31	3.10	-----	-----	-----	3.13	4.24	-----	-----
In 1888 <b>Higher</b> than in 1887.....	0.21	-----	0.08	0.34	0.72	-----	1.50	-----	1.64	0.25	1.55	3.55	3.16
In 1888 <b>Lower</b> than in 1887.....	-----	0.65	-----	-----	-----	7.28	-----	2.27	-----	-----	-----	-----	-----

NOTE.—The stations represented in the lines for average temperature for the years 1877-87 in Exhibit 5, are the following: Thornville, Kalamazoo, Detroit for 1877-87; Mendon for 1877-82; Tecumseh for 1877-85; Battle Creek for 1877-80, 1882, 1885; Nirvana for 1877-9, and first four months of 1880; Reed City for last eight months of 1880 and 1881-5; Coldwater, Ypsilanti, Woodmere Cemetery (near Detroit) for 1877-9; Otisville for 1878-80, 1882; Niles for 1878-9, 1881; Marquette for 1879-84, and 1888-7; Alpena, Grand Haven, Port Huron, Lansing for 1879-87; Washington for 1879-83; Benton Harbor for 1877-8; Agricultural College for 1877 and 1881-7; Petoskey for 1878-9; Escanaba for 1880-87; Harrisville for 1881-2 and 1885-6; Ann Arbor for 1881-7; Parkville for 1881-2; Traverse City, Marshall for 1882-7; Hillsdale for 1882-4; Winfield for 1881 and 1883; Hudson and Mallory Lake for 1881; Ionia for 1883-5; Manistique, Swartz Creek for 1884-5; Mackinaw City for 1884-7; Port Austin for 1885; Muskegon, Pentwater for 1886; Birmingham, Otsego, Gulliver Lake for 1887.

\* Beginning with the year 1885, allowance must be made for Lansing in Exhibit 5, because of a change in location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, Report for 1886.

Foot-notes from page 19.]

§ This line is an average for only the 13 stations at which observations were made tri-daily, and from which statements nearly complete were received for every month of the year. It does not include the U. S. Signal Service Stations and Harrisville.

|| This line is an average for the 5 U. S. Signal Service Stations.

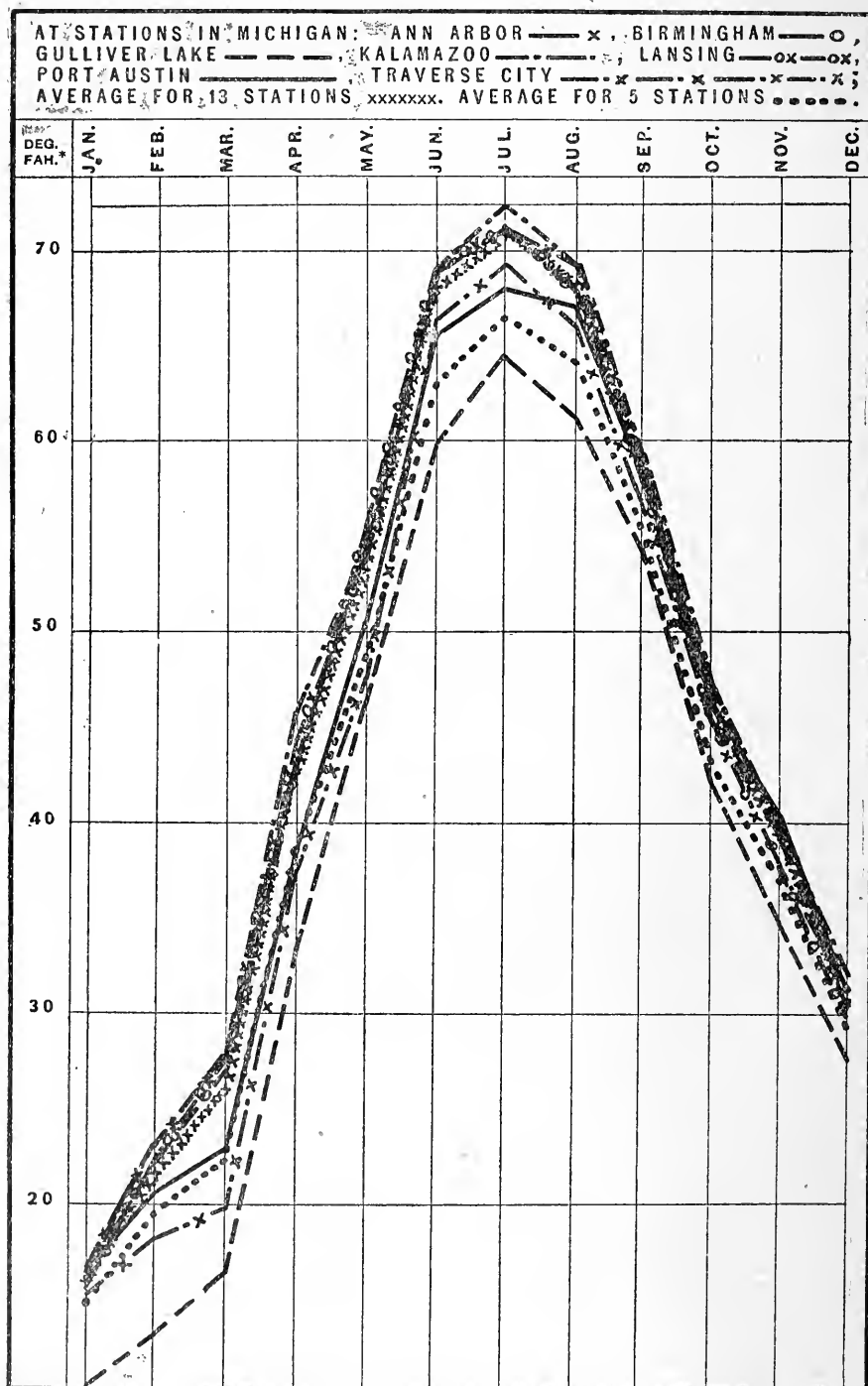
\* Numbers in this column state the average annual temperature for periods of years ending in each case with December 31, 1888. The small figures above and at the right of numbers which state the temperature, denote the number of years included in the average.

\*\* The computations of Av. Temp., as tabulated for months in 1888, were made at the following stations: Marquette, Grand Haven, Detroit, Ann Arbor, Alpena, Port Huron. All other computations in Table I. were made at the office of the State Board of Health.

†† Beginning with the year 1885, allowance must be made for Lansing in Table I., because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, Report for 1886.

‡ The names of divisions, and the counties in each, are stated in Exhibit I, in a paper which follows on weekly reports of sickness.

DIAGRAM 1.—AVERAGE TEMPERATURE, BY MONTHS, 1888.



\*SCALE, 10° F. TO 1. IN. VERTICALLY.

TABLE I.—Average Temperature in Degrees Fahr., for the Year, and for each Month of the Year 1888, at each of 18 Stations in Michigan, and also Average lines for 13 Stations and for 5 Stations. From Observations made Daily at 7 A. M., 2 P. M. and 9 P. M.,\* by Observers† for the State Board of Health, and for the U. S. Signal Service.

Stations in Michigan.†  (Those of the U. S. Signal Service in Italics.)	Division of the State.‡	Temperature in Degrees Fahr.													
		Year.	Months, ** 1888.												
			Norm. ¶	1888.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.
Av. for 13 Stations §			45.03	15.93	21.65	25.89	42.81	53.40	68.03	70.95	68.05	58.20	46.01	38.73	30.73
Av. for 5 Stations			41.77	14.66	19.36	22.28	38.42	48.64	63.02	66.38	63.96	55.25	43.22	36.93	29.13
		8													
Marquette.....	U. P.	38.57	37.00	8.50	12.00	14.60	33.20	43.20	57.92	63.60	60.40	51.85	39.94	33.17	25.63
Gulliver Lake.....	U. P.	38.58	10.29	13.09	16.40	33.38	46.16	59.78	64.42	61.09	54.18	42.08	34.56	27.56	
Traverse City.....	N. W.	42.49	42.60	15.27	18.20	19.77	37.47	47.48	66.32	68.99	65.88	56.87	45.73	37.93	31.28
Alpena.....	N. E.	41.04	39.70	13.60	17.20	18.60	34.50	44.50	62.00	64.20	62.10	55.88	41.65	34.80	27.34
Harrisville.....	N. E.	41.49	14.17	20.01	21.20	37.12	46.49	63.34	66.03	64.69	55.93	43.70	36.44	28.72	
Grand Haven.....	W.	46.37	43.38	16.97	21.20	24.44	41.50	50.10	63.20	67.90	64.40	54.90	45.40	38.60	32.00
Port Austin.....	B. & E.	43.73	16.22	20.53	22.81	38.23	50.52	65.38	67.89	66.97	58.50	46.29	40.32	31.04	
Port Huron.....	B. & E.	44.86	43.32	16.20	22.30	25.20	40.00	51.20	64.40	66.70	65.60	55.90	44.00	38.40	29.90
Thornville.....	B. & E.	47.61	45.82	16.52	22.72	26.82	42.99	55.25	69.46	70.80	69.17	59.02	46.26	39.86	30.95
Agricultural College	C.	46.40	45.03	15.40	21.95	27.03	44.03	53.65	67.89	70.53	67.55	57.76	45.70	38.50	30.39
Lansing, S. B. of H.††	C.	47.11	45.49	15.63	22.38	27.49	44.20	53.91	68.80	71.09	67.77	57.79	46.32	39.16	31.19
Otsego.....	S. W.	45.69	16.26	21.85	26.73	44.99	54.94	69.23	73.56	69.22	57.46	46.11	37.76	30.12	
Ann Arbor.....	S. C.	46.04	45.67	16.70	23.10	27.70	43.50	54.40	68.60	71.10	69.00	58.70	45.40	39.30	30.50
Battle Creek.....	S. C.	48.31	18.43	25.01	29.71	47.80	57.29	72.37	75.26	71.81	61.19	48.37	40.02	32.43	
Kalamazoo.....	S. C.	47.53	46.35	16.39	22.83	27.78	45.68	54.52	68.89	72.37	69.24	59.05	47.39	40.11	31.94
Marshall.....	S. C.	48.14	48.19	18.24	24.94	30.29	47.16	57.10	72.07	75.06	71.44	60.80	48.40	40.17	32.57
Tecumseh.....	S. C.	44.81	15.83	22.83	27.02	43.91	53.69	66.80	70.15	67.75	57.30	44.52	38.16	29.76	
Birmingham.....	S. E.	45.83	45.17	15.89	22.04	26.96	43.08	55.28	68.83	71.19	67.76	58.01	45.53	37.69	29.81
Detroit.....	S. E.	48.17	45.46	18.01	24.11	28.56	42.92	54.20	67.60	69.50	67.30	57.70	45.10	39.70	30.80

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 22 days. f For 21 days.

\* At the U. S. Signal Service Stations for the first six months of the year 1888, the observations were made at 7 A. M., 3 P. M., and 10 P. M., 75th meridian time, and one-third the sum of the three observations was taken as the daily average. The local time at these stations corresponding to 7 A. M., 3 P. M., and 10 P. M., 75th meridian time, is as follows: At Port Huron, 6:30 A. M., 2:30 P. M., and 9:30 P. M.; at Detroit, 6:28 A. M., 2:28 P. M., and 9:23 P. M.; at Alpena, 6:26 A. M., 2:26 P. M., and 9:26 P. M.; at Grand Haven, 6:15 A. M., 2:15 P. M., and 9:15 P. M.; at Marquette, 6:11 A. M., 2:11 P. M., and 9:11 P. M. At the U. S. Signal Stations for the last six months of the year 1888 the observations were made at 8 A. M. and 8 P. M., 75th meridian time, and one-half the sum of the two observations was taken as the daily average. The local time at these stations corresponding to 8 A. M. and 8 P. M., 75th meridian time, is as follows: At Port Huron, 7:30 A. M. and 7:30 P. M.; at Detroit, 7:28 A. M. and 7:28 P. M.; at Alpena, 7:26 A. M. and 7:26 P. M.; at Grand Haven, 7:15 A. M. and 7:15 P. M.; at Marquette, 7:11 A. M. and 7:11 P. M. At the other stations the observations were made at 7 A. M., 2 P. M., and 9 P. M., local time, and the daily averages were one-third the sum of these three observations.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2.

[The remaining foot-notes are on page 17.]

The lines for 6 representative stations in Table I. are graphically represented in Diagram I., page 18.

TABLE II.—*Extremes of Temperature and Days of Month on which the Highest and for the Year 1888, at each of 16 Stations in Michigan.—As indicated by Daily Readings P. M., by Observers\* for the State Board of Health, and for the U. S. Signal Service.*

Line Number.	Stations in Michigan.* (Those of the U. S. Signal Service in Italics.)	Year, 1888.			January.		February.		March.		April.		May.	
		Highest.	Lowest.	Range.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1	At 16 Stations.†	99	-33	132	45	-23	49	-33	69	-20	88	6	84	21
2	Marquette.....\$	94	-27	121	80 29 30, 31	20, 21 -21 16	16 40 22, 24	9 -27 -14	19 40 19	23 -11 23	27 62 27	7, 8 14 2, 7	24 76 24, 25	2 22 1
3	Gulliver Lake ‡	88	-33	121	34 6, 12	-23 20	40 13, 24	-33 9	44 19	-20 22	57 27	6 7	76 21	1 1
4	Traverse City ‡	98	-26	124	35 13	-23 22	48 13	-26 10	50 19, 20	-17 23	88 27	9 3	81 22	2 2
5	Alpena.....\$	90	-23	113	37 21	-16 21	48 13	-23 9	49 19	-10 22	71 27	11 2	72 22	1 1
6	Harrisville ...‡	96	-26	122	38 13	-22 22	46 20	-26 9	48 19	-13 10	80 27, 28	11 2	76 22	1 1
7	Grand Haven.\$	91	-7	98	37 1	-5 11	44 13, 20	-7 14	64 19	1 6, 6	74 27, 28	23 2	78 30	14
8	Port Austin...‡	93	-15	108	40 1	-15 21	42 20	-7 9	57 19	28 28	81 28	21 6	79 32	2
9	Port Huron...\$	93	-13	106	44 13	-7 13	49 13	-13 9	61 19	-4 23	82 27	20 8	80 29	16
10	Thornville....‡	93	-16	109	38 7, 14, 13	-13 20	47 18, 23, 24	-16 9	66 19	-7 22	85 27, 28	22 7	83 33	1
11	Agr'l College. ‡	92	-19	111	36 6, 7, 12, 13	-16 21	45 13, 24	-19 9	69 19	2 22	81 27, 28	21 8	80 27	1
12	Lansing, S. B. of H.....‡	92	-16	108	37 6	-16 21	44 20	-16 9, 10, 15	68 19	0 23	80 28, 29	21 8	80 27	2
13	Ann Arbor....‡	95	-10	105	39 6	-7 21	45 19	-10 9	69 19	-1 22	80 27, 28, 29	22 7	79 28	1
14	Battle Creek...‡	92	-9	101	41 6	-6 21	45 24	-9 10	67 19	6 23	80 28	26 3	80 34	2
15	Kalamazoo....‡	91	-8	99	41 6	-4 20, 21	47 19, 24	-8 9	67 19	4 22	83 27, 28, 29	25 2	80 33	1
16	Marshall.....‡	99	-10	109	45 13	-10 21	45 18	-9 9	68 19	4 22	84 28, 29	24 8	84 30	1
17	Birmingham...‡	96	-18	114	40 1	-14 21	45 23, 26	-18 15	65 19	-11 23	84 28	18 8	81 22	2
18	Detroit.....\$	95	-7	102	43	-3	46	-7	65	2	82	23	79	30

NOTE.—The small figures above and at the right of numbers denoting the degrees of temperature, state the day or days of the month on which the highest or the lowest temperature occurred.

\* The names of observers, etc., are stated in Exhibit 1, page 2.

† The line No. 1, and the three columns for the year 1888, relate only to the 16 stations from which observations were received for every month of the year. It does not include Birmingham.

‡ For stations marked thus ‡, the daily readings of registering thermometers were recorded at 7 A. M. for the preceding calendar day.

§ At the stations of the U. S. Signal Service the maximum thermometer was read and recorded at the morning observation, and the minimum at the evening observation.

¶ At Ann Arbor the registering thermometers were read and recorded at 9 P. M.

|| Beginning with the year 1885 allowance must be made for Lansing in Table II., because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit B. on page 22, Report for 1886.

*the Lowest Temperature occurred by Months of the year 1888; also, Extremes and Range of Registering Thermometers, or by Observations made daily at 7 A. M., 2 P. M. and 9*

June.		July.		August.		September.		October.		November.		December.		Line Number.
Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	
99	29	97	40	94	33	90	28	73	23	72	8	55	1	1
16 94	7 35	3 91	12 47	95 94	81 43	3 83	28, 29 36	25 66	9 29	1 59	17 11	23 47	30 11	2
17, 20 88	6 30	5 87	12, 13 44	4 81	31 33	11 76	28 33	19, 18 60	20 23	1 53	16 11	23 42	12 5	3
21 98	9 33	3 97	19 45	25 89	31 40	3 85	28 32	25 66	9 25	2 67	17 8	23 50	21 9	4
21 87	1 35	6 88	2 46	25 90	28 39	3 82	28 32	31 66	9 26	2 67	18 12	24 47	22 5	5
17 96	2 29	6 92	1 40	3 90	11 40	11 86	27 28	27 65	20 26	2 67	16, 17 10	17 49	19 1	6
18 91	2 39	5 84	13 48	3 80	28 46	7 74	14 37	26 64	9 30	1 72	18, 20 19	26 50	13, 22 17	7
17 90	2 38	3 93	1 46	3 92	22 46	8 79	29 40	31 70	1 31	1 65	26 19	30 49	19 12	8
17 93	3 37	11 89	13 49	3 91	23 41	8 82	29 32	31 72	10 27	1 67	21 20	26 53	29 9	9
21 92	3 41	30 90	10, 13 50	3 93	28 41	11 90	29 34	31 73	10 27	2 72	17 18	26 49	19 5	10
17, 20 92	3 39	30 90	12 47	26 90	27 36	11 88	27 32	31 73	8 26	1 72	21 13	23 52	13, 13 9	11
17 92	3, 4, 6 41	3, 4 88	12 48	26 89	27 39	11 86	27 33	31 72	8 26	1 71	21 14	23, 24 51	13 8	12
17 94	3 42	5 95	13, 14 48	3 92	28 45	11 86	29 35	31 71	1 28	1 69	20, 21 21	26 51	22 9	13
19 92	2, 3 43	30 90	13 50	3 91	27, 27 45	28 85	29 37	31 73	20 29	1 71	20 19	23 49	14, 18 16	14
17, 20 91	2 41	30 90	13 50	3, 4 91	23 46	11 88	29 37	31 73	21 28	1 71	21 18	26 52	13, 19 11	15
17 99	3 41	29 93	12 50	3 94	27, 27 44	11 88	27 36	31 73	9 27	1 72	17 19	26 49	13, 14 14	16
18 96	2 35	4 94	19 43	3 96	22 35	11 88	27 27	31 71	3 21	1 72	17 18	26 52	19 3	17
17 95	1 45	11 91	12, 13 50	4, 26 91	23, 24 46	5 84	29 35	31 73	3 30	1 70	21 22	26 55	22 13	18

[Foot-notes to Table V., from page 31.]

†† Beginning with the year 1885, allowance must be made for Lansing in Table V. because of a change in location of the instruments. The amount of the variation by months is shown in Exhibit D., page 23, Report for 1886.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

## At Marquette a whirling psychrometer was used in 1888.

a For 92 observations. b For 91 observations. c For 90 observations. d For 89 observations.

e For 88 observations. f For 87 observations. g For 86 observations. h For 83 observations.

i For 82 observations. j For 64 observations.

EXHIBIT 6.—*Comparison of the Average Temperature during the Year and during each month of the Year, 1888, with the Annual and with the Monthly Averages for the Year 1887, and with the Averages for the 24 Years, 1864-87. Observations made by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, etc.	Average Temperature.—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 24 yrs., 1864-87..	46.48	21.52	23.77	30.96	45.71	58.35	67.69	71.64	68.77	60.34	48.33	35.31	25.40
1887.....	46.60	18.20	24.26	28.29	45.37	64.28	68.53	75.51	67.96	58.86	44.97	35.66	27.30
1888.....	45.03	15.40	21.95	27.03	44.03	53.65	67.89	70.53	67.55	57.76	45.70	38.50	30.39
In 1888 <b>Higher</b> than Av. for 24 years, 1864-87.....	-----	-----	-----	-----	-----	-----	.20	-----	-----	-----	-----	3.19	4.99
In 1888 <b>Lower</b> than Av. for 24 years, 1864-87.....	1.45	6.12	1.82	3.93	1.68	4.70	-----	1.11	1.22	2.58	2.63	-----	-----
In 1888 <b>Higher</b> than in 1887.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	.73	2.84	3.09
In 1888 <b>Lower</b> than in 1887.....	1.57	2.80	2.31	1.26	1.34	.63	.64	4.98	.41	1.10	-----	-----	-----

EXHIBIT 7.—*Average Temperature,\* by Year and Months, for the 9 Years, 1879-87. Observations made at Office State Board of Health, State Capitol, Lansing, Michigan.*

Years, Etc.	Average Temperature.—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 9 years, 1879-87.	47.29	20.87	23.95	31.00	46.02	59.51	67.62	72.86	69.13	62.00	51.29	36.69	26.60
1887.....	46.69	18.26	24.39	27.81	45.27	64.24	69.44	75.76	67.06	58.66	45.19	36.59	27.63
1888.....	45.49	15.63	22.38	27.49	44.30	53.91	68.80	71.09	67.77	57.79	46.32	39.16	31.19
In 1888 <b>Higher</b> than Av. for 9 years, 1879-87.	-----	-----	-----	-----	-----	-----	1.18	-----	-----	-----	-----	2.47	4.59
In 1888 <b>Lower</b> than Av. for 9 years, 1879-87.....	1.80	5.24	1.57	3.51	1.72	5.60	-----	1.77	1.36	4.21	4.97	-----	-----
In 1888 <b>Higher</b> than in 1887.....	-----	-----	-----	-----	-----	-----	-----	-----	.61	-----	1.13	2.57	3.56
In 1888 <b>Lower</b> than in 1887.....	1.20	2.63	2.01	.32	.97	10.33	.64	4.67	-----	.87	-----	-----	-----

\* Beginning with the year 1885, slight allowance should be made for Lansing in Exhibit 7, because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, Report for 1886.



EXHIBIT 8.—Average Daily Range of Temperature, by Year and Months in 1888, compared with Annual and Monthly Averages for 1887, and for the 9 years, 1879-87. These Averages are for Groups of Several Stations in Michigan.\*

Years, etc.	Average Daily Range of Temperature—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 9 years, 1879-87*	18.31	16.52	18.10	18.02	19.43	21.02	20.63	20.66	19.95	19.74	17.55	14.71	13.37
1887 (17 stations)....	18.46	17.96	17.06	18.02	19.52	22.52	20.68	21.91	20.81	19.79	16.50	14.80	11.88
1888 (15 stations)....	17.42	15.28	17.70	17.73	18.70	18.04	21.11	20.68	20.21	20.33	14.53	13.47	11.28
In 1888 <b>Greater</b> than average for 9 years, 1879-87.....	.....	.....	.....	.....	.....	.....	0.48	0.02	0.26	0.59	.....	.....	.....
In 1888 <b>Less</b> than average for 9 years, 1879-87.....	0.89	1.24	0.40	0.29	0.73	2.98	.....	.....	.....	.....	2.97	1.24	2.09
In 1888 <b>Greater</b> than in 1887.....	.....	.....	0.64	.....	.....	.....	0.43	.....	.....	0.54	.....	.....	.....
In 1888 <b>Less</b> than in 1887.....	1.04	2.68	.....	0.29	0.62	4.48	.....	1.23	0.60	.....	1.92	1.33	0.60

\* Marquette for 1879-84 and 1886-7; Grand Haven, Lansing, Detroit for 1879-87; Otisville for 1879-80 and 1882; Battle Creek for 1879-80; Escanaba, Alpena, Port Huron, Thornville for 1880-87; Kalamazoo for 1880-83 and 1896-7; Adrian for 1880; Agricultural College for 1881-7; Traverse City, Marshall for 1882-7; Harrisville for 1882 and 1885-7; Reed City for 1882 and 1884-5; Ann Arbor for 1882-3 and 1885-7; Washington for 1882-3; Winfield for 1883; Tecumseh for 1883-5; Manistique, Ionia, Swartz Creek for 1884-5; Mackinaw City for 1884-7; Hillsdale for 1884; Pentwater, East Saginaw, Hudson for 1886; Birmingham, Gulliver Lake for 1887.

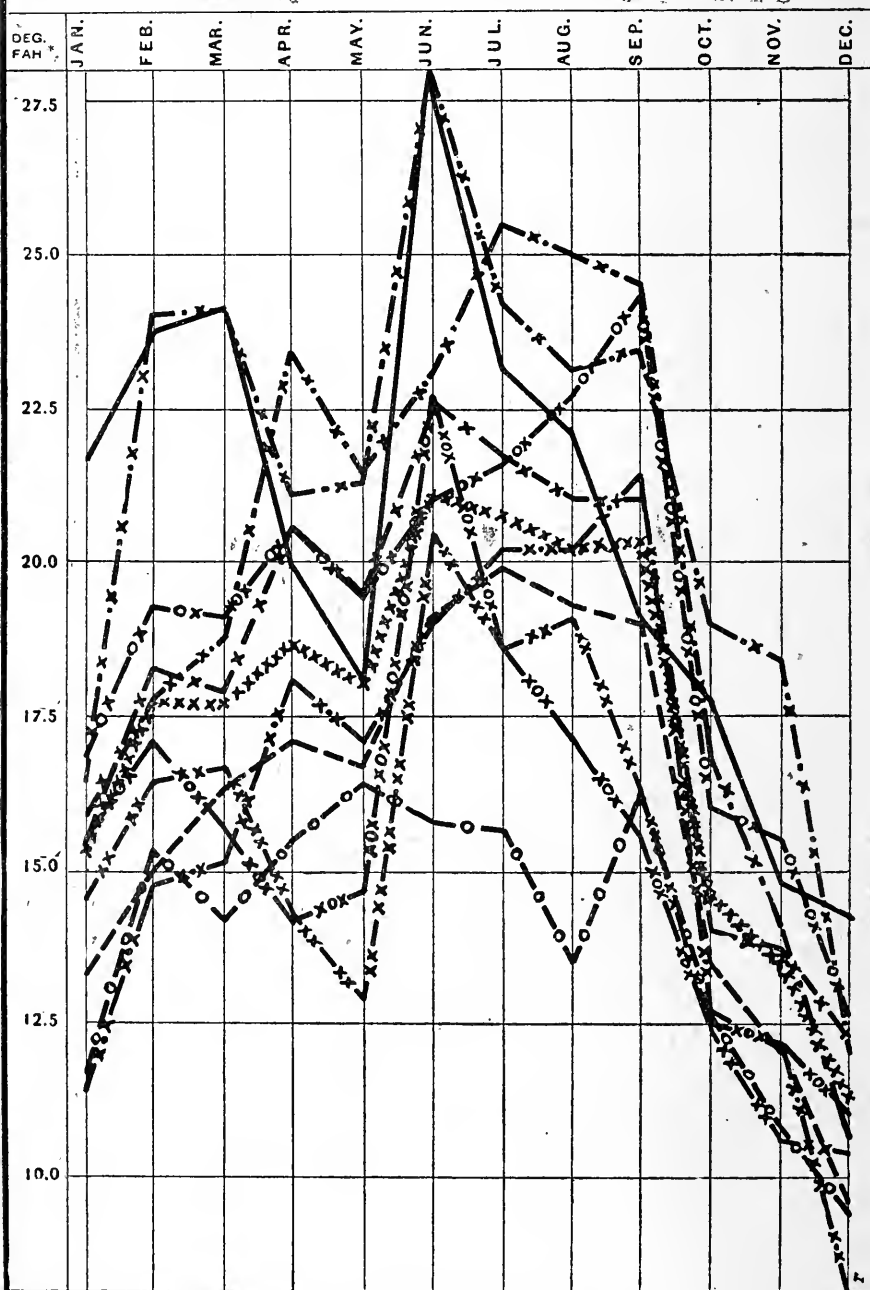
EXHIBIT 9.—Comparisons of the Average Daily Range of Temperature for the Year and for each Month of the Year 1888, with Averages for the 14 Years, 1874-87, and for the Year 1887. Observations made with Registering Thermometers by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.

Years, etc.	Average Daily Range of Temperature.—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 14 yrs., 1874-87*.	21.05	16.99	19.09	19.27	22.55	24.82	23.38	25.05	25.57	23.95	20.47	16.26	15.21
1887.....	21.81	20.77	17.36	20.45	23.53	26.26	22.13	26.10	26.42	23.90	20.06	17.27	17.43
1888.....	19.76	17.71	19.72	18.61	21.57	19.54	21.07	24.35	24.64	26.34	15.84	15.87	11.87
In 1888 <b>Greater</b> than Av. for 14 yrs., 1874-87.....		.72	.63							2.39			
In 1888 <b>Less</b> than Av. for 14 years, 1874-87.....	1.29			.66	.98	5.28	2.31	.70	.93		4.63	.39	3.34
In 1888 <b>Greater</b> than in 1887.....			2.36							2.44			
In 1888 <b>Less</b> than in 1887.....	2.05	3.06		1.84	1.96	6.72	1.06	1.75	1.78		4.22	1.40	5.61

\* For the years 1874-6, 1878, 1879 (except Nov. and Dec.), and 1880, the computations were made from the report of observations published in the Reports of the State Board of Agriculture for those years. For 1877, 1881 (except Jan.), 1882-88, the computations were made from registers or copies of registers supplied by Dr. Kedzie.

DIAGRAM II.—AV. DAILY RANGE OF TEMP., BY MONTHS, 1888.

BY REGIST. THERMRS.—AT STATIONS IN MICHIGAN: ALPENA —x x, ANN ARBOR —x, DETROIT —o, GRAND HAVEN —o, GULLIVER LAKE —, LANSING —o x, MARQUETTE —x o x, MARSHALL —x, THORNVILLE —x x, TRAVERSE CITY —. x ; AVERAGE FOR 15 STATIONS xxxxxxxx.



\*SCALE, 5° F. RANGE TO 1.60 IN. VERTICALLY.

TABLE III.—Average Daily Range of Temperature, by Registering Thermometers, during the Year and during each Month of the Year 1888, at each of 17 Stations in Michigan, and Average for 15 Stations.

Stations in Michigan.* (Those of the U. S. Signal Service in Italics.)	Divi- sions of the State.†	Norm. ‡	Average Daily Range of Temperature.—Degrees Fahr.												
			Yr. 1888.	Months, 1888.											
				Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 15 Stations. §	-----	-----	17.42	15.28	17.70	17.73	18.70	18.04	21.11	20.68	20.21	20.33	14.58	13.47	11.28
Marquette.....	U. P.	16.66 <sub>3</sub>	15.58	15.50	17.10	15.70	14.20	14.70	22.70	18.50	17.10	15.60	12.50	12.20	11.10
Gulliver Lake.....	U. P.	20.98	20.33	21.65	23.69	24.16	19.90	18.10	25.27 <sup>a</sup>	23.10	22.06	19.17	17.77	14.80	14.26
Traverse City.....	N. W.	19.43 <sub>9</sub>	21.26	16.39	24.00	24.13	21.13	21.29	28.05	24.19	23.13	23.40	19.03	18.40	12.00
Alpena.....	N. E.	16.22 <sub>9</sub>	15.22	14.50	16.40	16.70	14.30	12.90	20.40	18.60	19.10	16.30	12.40	10.60	10.40
Harrisville.....	N. E.	21.66 <sub>10</sub>	21.08	20.52	21.86	19.87	20.00	22.45	23.23	27.42	24.90	21.60	15.55	15.20	15.39
Grand Haven.....	W.	14.05	13.94	11.70	15.30	14.20 <sub>f</sub>	15.50	16.40	15.80	15.70	13.50	16.30	12.70 <sub>d</sub>	10.80 <sub>b</sub>	9.40 <sub>f</sub>
Port Austin.....	B. & E.	15.14 <sub>9</sub>	15.67 <sub>e</sub>	15.92	15.13	15.87	17.84 <sub>c</sub>	18.80	17.71	16.00 <sub>f</sub>	16.92 <sub>c</sub>	11.12 <sub>d</sub>	10.13 <sub>b</sub>	10.57 <sub>f</sub>	
Port Huron.....	B. & E.	16.06 <sub>9</sub>	16.14	13.60	15.30	15.80	17.40	17.90	20.50	17.50	18.80	19.00	13.00	12.90	12.00
Thornville.....	B. & E.	16.61 <sub>7</sub>	15.87	11.39	14.76	15.16	18.07	17.10	19.07	20.23	20.23	21.40	12.74	12.13	8.16
Agricultural College.	C.	20.23 <sub>10</sub>	19.76	17.71	19.72	18.61	21.57	19.54	21.07	24.35	24.64	26.34	15.84	15.87	11.87
Lansing, S. B. of H....	C.	19.43 <sub>7</sub>	19.10	16.84 <sub>f</sub>	19.31	19.16	20.63	19.39	21.00	21.61	22.71	24.33	16.03	15.50	12.65
Ann Arbor.....	S. C.	18.14	18.16	15.40	18.30	17.90	20.50	19.60	22.54	21.72	21.00	21.00	14.03 <sub>f</sub>	13.67 <sub>b</sub>	12.34 <sub>f</sub>
Battle Creek.....	S. C.	17.35 <sub>3</sub>	15.55	16.21	17.65	19.80	18.16	18.93	21.38	20.29	20.93	15.63	13.60	10.37	
Kalamazoo.....	S. C.	17.24 <sub>7</sub>	17.86	14.08	16.64	16.45	21.07	19.76	20.30	20.13	20.29	20.73	15.61	15.37	13.83
Marshall.....	S. C.	19.49 <sub>9</sub>	19.75	15.87	17.83	18.84	23.43	21.39	23.10	25.52	25.00	24.50	16.91	14.07	10.68
Birmingham.....	S. E.	23.15 <sub>10</sub>	23.61	19.87	22.07	21.23	24.38	23.69	27.98	29.42	30.69	29.76	22.17	18.33	13.68
Detroit.....	S. E.	15.81	15.90	13.30	15.00	16.30	17.10	16.70	19.10	19.90	19.30	19.00	13.50	12.00	9.60

\* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit I, page 2.

† For counties in each division see Exhibit I, in a paper which follows on weekly reports of sickness.

‡ Numbers in this column state the annual average range of temperature for periods of years ending in each case with December 31, 1888. The small figures above and at the right of numbers which state the range of temperature, denote the number of years included in the average.

§ This line is an average for all stations for which statements nearly complete are given for every month of the year. It does not include the lines for Harrisville and Birmingham.

a, b, c, In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 21 days. b For 23 days. c For 25 days. d For 26 days. e For 27 days. f For 30 days.

NOTE.—Graphic representations of statements in Table III., are given in Diagram II, page 24.

[Foot-notes to Table IV., from page 29.]

¶ The computations of Absolute Humidity at Ann Arbor for each month in 1888, were furnished by the observer there. All other computations in Table IV. were made at the office of the Secretary of the State Board of Health.

a, b, c, In the columns from January to December, inclusive, the letters a, b, c, stand directly above the numbers from which they refer to the notes below.

a For 92 observations. b For 91 observations. c For 90 observations. d For 89 observations.

e For 88 observations. f For 87 observations. g For 86 observations. h For 85 observations.

i For 82 observations. j For 65 observations.



EXHIBIT 11.—Average Absolute Humidity, by Year and Months, in 1888, compared with Annual and Monthly Averages for 1887, and for the 11 years 1877-87\*. These Averages are for Groups of several Stations in Michigan.

Years, etc.	Absolute Humidity—Grains of Vapor in a Cubic Foot of Air.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 11 years, 1877-87†	3.42	1.36	1.50	1.78	2.73	3.96	5.29	6.09	5.78	4.92	3.65	2.29	1.73
1887 (16 stations).....	3.29	1.25	1.45	1.49	2.63	4.43	5.50	6.29	5.22	4.37	2.98	2.16	1.77
1888 (9 stations).....	3.31	1.25	1.51	1.67	2.55	3.69	5.71	5.95	5.59	4.30	3.05	2.49	1.92
In 1888 <b>Greater</b> than average for 11 years, 1877-87.....	.....	.....	0.01	.....	.....	.....	0.42	.....	.....	.....	.....	0.20	0.19
In 1888 <b>Less</b> than Av. for 11 years, 1877-87.....	0.11	0.11	.....	0.11	0.18	0.27	.....	0.14	0.19	0.62	0.60	.....	.....
In 1888 <b>Greater</b> than in 1887.....	0.02	0	0.06	0.18	.....	.....	0.21	0.66	0.37	.....	0.07	0.33	0.15
In 1888 <b>Less</b> than in 1887.....	.....	.....	.....	.....	0.08	0.74	.....	.....	.....	0.07	.....	.....	.....

\* Beginning with the year 1885, allowance must be made for Lansing in Exhibit 11, because of a change in the location of the instruments. The amount of variation by months is shown in Exhibit C., on page 23, Report for 1886.

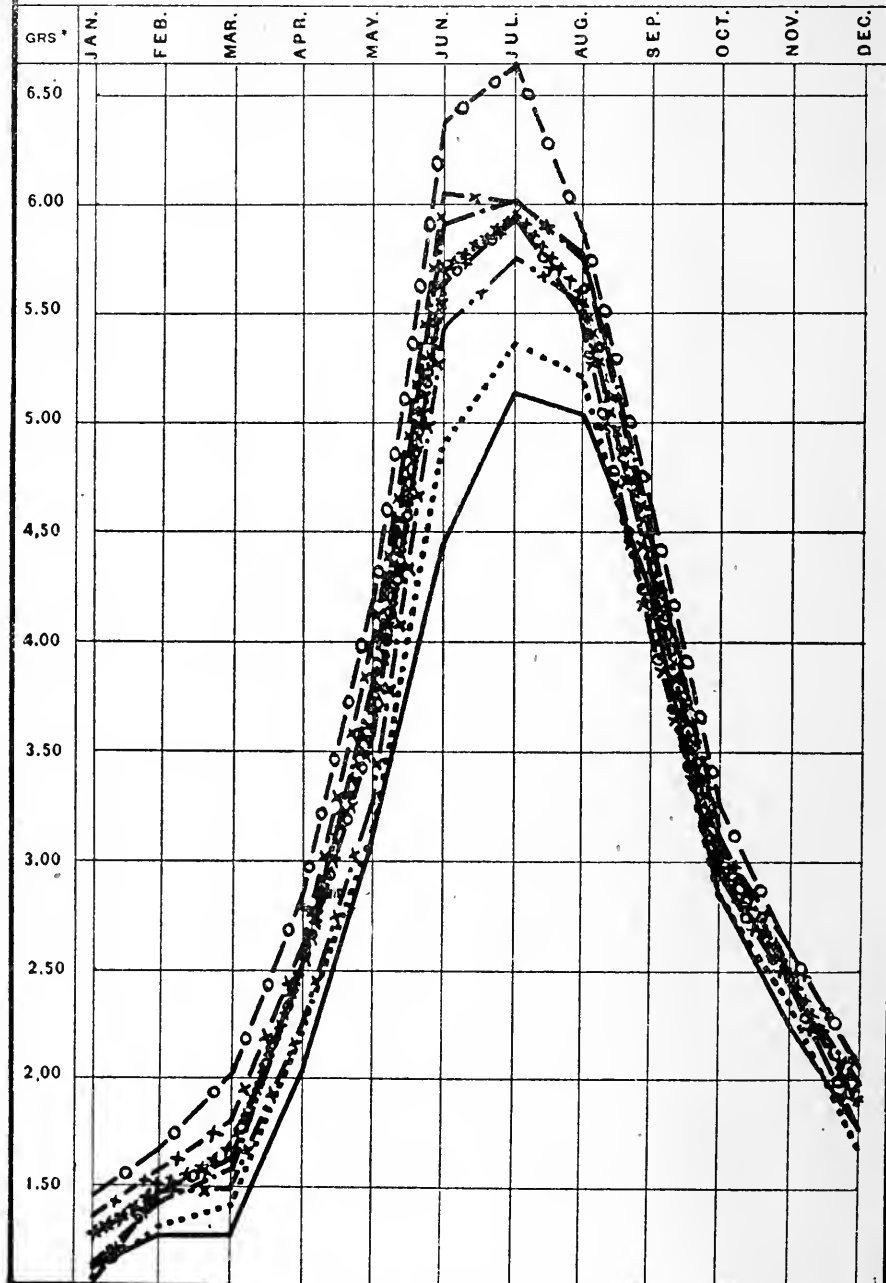
† Thornville, Detroit for 1877-87; Kalamazoo for 1877-83 and 1886-7; Mendon for 1877-82; Tecumseh for 1878-85; Battle Creek for 1877-9, 1882 and 1885; Otisville for 1878-80, and 1882; Marquette for 1879-84 and 1886-7; Alpena, Grand Haven, Port Huron, Lansing for 1879-87; Agricultural College for 1877, 1881-7; Niles for 1878-9 and 1881; Nirvana for 1878-9 and first 4 months of 1880; Reed City for last 8 months of 1880 and 1881-5; Benton Harbor, Coldwater for 1877-8; Escanaba for 1880-7; Washington for 1880-3; Petoskey for 1879; Winfield for 1881 and 1883; Ann Arbor for 1881-7; Woodmere Cemetery (near Detroit) for 1877-9; Traverse City, Marshall for 1882-7; Harrisville for 1882 and 1885-6; Parkville, Hastings for 1882; Hillsdale for 1882-4; Manistique and Swartz Creek for 1884-5; Mackinaw City for 1884-7; Ionia for 1884; Pentwater for 1886; Gulliver Lake and Birmingham for 1887.

EXHIBIT 12.—Comparison of the Average Absolute Humidity for the Year, and for each Month of the Year 1888, with averages for the 22 Years 1866-87, and for the Year 1887. Observations made at 7 A. M., 2 P. M., and 9 P. M., daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich.

Years, etc.	Absolute Humidity—Grains of Vapor in a Cubic Foot of Air.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 22 years, 1866-87	3.48	1.43	1.55	1.85	2.69	4.08	5.62	6.45	5.96	4.85	3.36	2.18	1.65
1887.....	3.41	1.41	1.67	1.66	2.72	4.81	5.75	6.24	5.07	4.48	3.03	2.24	1.78
1888.....	3.26	1.18	1.52	1.65	2.48	3.63	5.68	5.89	5.51	4.07	3.07	2.56	1.88
In 1888 <b>Greater</b> than average for 22 years, 1866-87.....	.....	.....	.....	.....	.....	.....	.06	.....	.....	.....	.....	.38	.23
In 1888 <b>Less</b> than Av. for 22 years, 1866-87.....	.22	.25	.03	.20	.21	.45	.....	.56	.45	.78	.29	.....	.....
In 1888 <b>Greater</b> than in 1887.....	.....	.....	.....	.....	.....	.....	.....	.....	.44	.....	.04	.32	.10
In 1888 <b>Less</b> than in 1887.....	.15	.23	.15	.01	.24	1.18	.07	.35	.....	.41	.....	.....	.....

DIAGRAM III.—ABSOLUTE HUMIDITY, BY MONTHS. 1888.

GRS. OF VAPOR IN CU. FOOT OF AIR.—AT STATIONS IN MICH.: BIRMINGHAM ———, GULLIVER LAKE ———, LANSING —○—, MARSHALL —○—, THORNVILLE —x—x, TRAVERSE CITY —.x; AV. FOR 9 STATIONS xxxxxx. AV. FOR 5 STATIONS .....



\* SCALE, ONE GRAIN OF VAPOR (IN A CU. FT. OF AIR) TO 1.13 IN. VERTICALLY.

TABLE IV.—ABSOLUTE HUMIDITY.—*The Average Number of Grains of Vapor of Water in a Cubic Foot of Air for Months and Year 1888, at 16 Stations in Michigan; also Average Lines for 9 Stations and for 5 Stations.—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,\* by Observers † for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.†  (Those of U. S. Signal Service in Italics.)	Divisions of the State.‡	Grains of Vapor in a Cubic Foot of Air—(Absolute Humidity.)													
		Year.		Months, 1888.											
		Norm. §	1888.	Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 9 Stations ¶.....			3.31	1.25	1.51	1.67	2.55	3.69	5.71	5.95	5.59	4.30	3 05	2.49	1.92
Av. for 5 Stations **.....			2.96	1.06	1.31	1.40	2.20	3.16	4.89	5.36	5.20	4.10	2.85	2.35	1.67
Marquette §§.....	U. P.	2.70 <sup>3</sup> <sub>9</sub>	2.58	0.75	0.95	0.97	1.90	2.67	4.25	5.10	4.74	3.67	2.54	2.03	1.37
Gulliver Lake.....	U. P.	2.96 <sup>g</sup> <sub>7</sub>	2.87	1.11	1.27	1.27	2.03	3.08	4.44	5.13	5.03	4.21	2.85	2.25	1.77
Traverse City .....	N. W.	3.35 <sup>7</sup> <sub>10</sub>	3.18	1.27	1.46	1.48	2.26	3.26	5.43	5.75	5.53	4.31	2.98	2 45	1.98
Alpena.....	N. E.	2.93 <sup>10</sup> <sub>10</sub>	2.86	1.01	1.20	1.27	2.07	2.94	4.79	5.08	4.89	4.07	2.85	2.37	1.72
Harrisville.....	N. E.	2.57 <sup>10</sup> <sub>10</sub>	0.72	0.99	1.04	1.85	2.63	4.47	4.87	4.70	3.85	2.45	1.90	1.33	
Grand Haven.....	W.	3.39 <sup>10</sup> <sub>10</sub>	3.09	1.21	1.50	1.53	2.36 <sup>h</sup> <sub>f</sub>	3.30	5.05	5.52	5.32 <sup>i</sup> <sub>f</sub>	4.05 <sup>j</sup> <sub>f</sub>	2.96	2.45	1.87
Port Austin.....	B. & E.	3.31 <sup>10</sup> <sub>10</sub>	3.11	1.17	1.46	1.57	2.30	3.45	5.12	5.44	5.63	4.20	2.87	2.42	1.66
Port Huron.....	B. & E.	3.70 <sup>13</sup> <sub>13</sub>	3.45	1.35	1.57	1.80	2.61	4.00	6.06	6.01	5.77	4.46	3.09	2.60	2.07
Thornville .....	B. & E.	3.70 <sup>9</sup> <sub>9</sub>	3.45	1.35	1.57	1.80	2.61	4.00	6.06	6.01	5.77	4.46	3.09	2.60	2.07
Agricultural College	C.	3.49 <sup>10</sup> <sub>10</sub>	3.26	1.18	1.52	1.65	2.48	3.63	5.68	5.89	5.51	4.07	3.07	2.56	1.88
Lansing, S. B. of H.††	C.	3.38 <sup>8</sup> <sub>8</sub>	3.21	1.05	1.46	1.62	2.55	3.57	5 64	5.93	5.48	4.04	2.94	2.43	1.77
Ann Arbor ¶¶.....	S. C.	3.43 <sup>3</sup> <sub>3</sub>	3.41	1.26	1.63	1.75	2.56	3.75	5.96	6 07	5.81	4.49 <sup>d</sup> <sub>e</sub>	3.07	2.59	1.92
Battle Creek.....	S. C.	4.28 <sup>3</sup> <sub>3</sub>	1.43	1.87	2.1 <sup>a</sup> <sub>1</sub>	3.58	4.80	7.53	8.03	7.33	5.48	3.75	3.04	2.30 <sup>a</sup> <sub>a</sub>	
Kalamazoo .....	S. C.	3.48 <sup>1</sup> <sub>1</sub>	3.42	1.43	1.61	1.9 <sup>a</sup> <sub>1</sub>	3.07	3.93	5.88	6.09	5.53	4.11	3.06	2.48	1.95
Marshall.....	S. C.	3.71 <sup>2</sup> <sub>2</sub>	3.63	1.45	1.67	2.02	2.86	4.18	6 38	6.67 <sup>b</sup> <sub>b</sub>	5.88	4 59	3.25	2.60	2.06
Birmingham.....	S. E.	3.39 <sup>12</sup> <sub>12</sub>	3.34	1.13	1.41	1.56	2.54	3.82	5.91	6.02	5.74	4.44	3.14	2.49	1.88
Detroit.....	S. E.	3.51	3.19	1.16	1.46	1.65	2.37	3.46	5.23	5.66	5.44	4.49	3.05	2.50	1.75

\* At the U. S. Signal Service Stations for the first six months of the year 1888, the observations were made at 7 A. M., 3 P. M., and 10 P. M., 75th meridian time; for the last six months, at 8 A. M. and 8 P. M., 75th meridian time. The local time corresponding to these hours is stated in the star (\*) foot-note to Table I., page 19.

† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit I., page 2.

‡ The full names of the divisions and the counties in each division are stated in Exhibit I., in a paper which follows, on weekly reports of sickness.

§ Numbers in this column state the average annual Absolute Humidity for periods of years ending in each case with Dec. 31, 1888. The small figures above and at the right of numbers which state the Absolute Humidity, denote the number of years included in the average.

|| The number of grains of vapor in a cubic foot of air at each observation was determined from readings of the psychrometer by means of Glaisher's table, Table XII. of the Smithsonian Meteorological and Physical Tables (1859).

¶ This line is an average for only the stations at which observations were made tri-daily, and from which statements, nearly complete, were received for every month in the year. It does not include the lines for Harrisville, Battle Creek, and the U. S. Signal Service Stations.

¶¶ This line is an average for the 5 U. S. Signal Service Stations.

†† The average for 7 months in 1888, is 4.43.

‡‡ Beginning with the year 1885, allowance must be made for Lansing in Table IV., because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit C, page 23, Report for 1886.

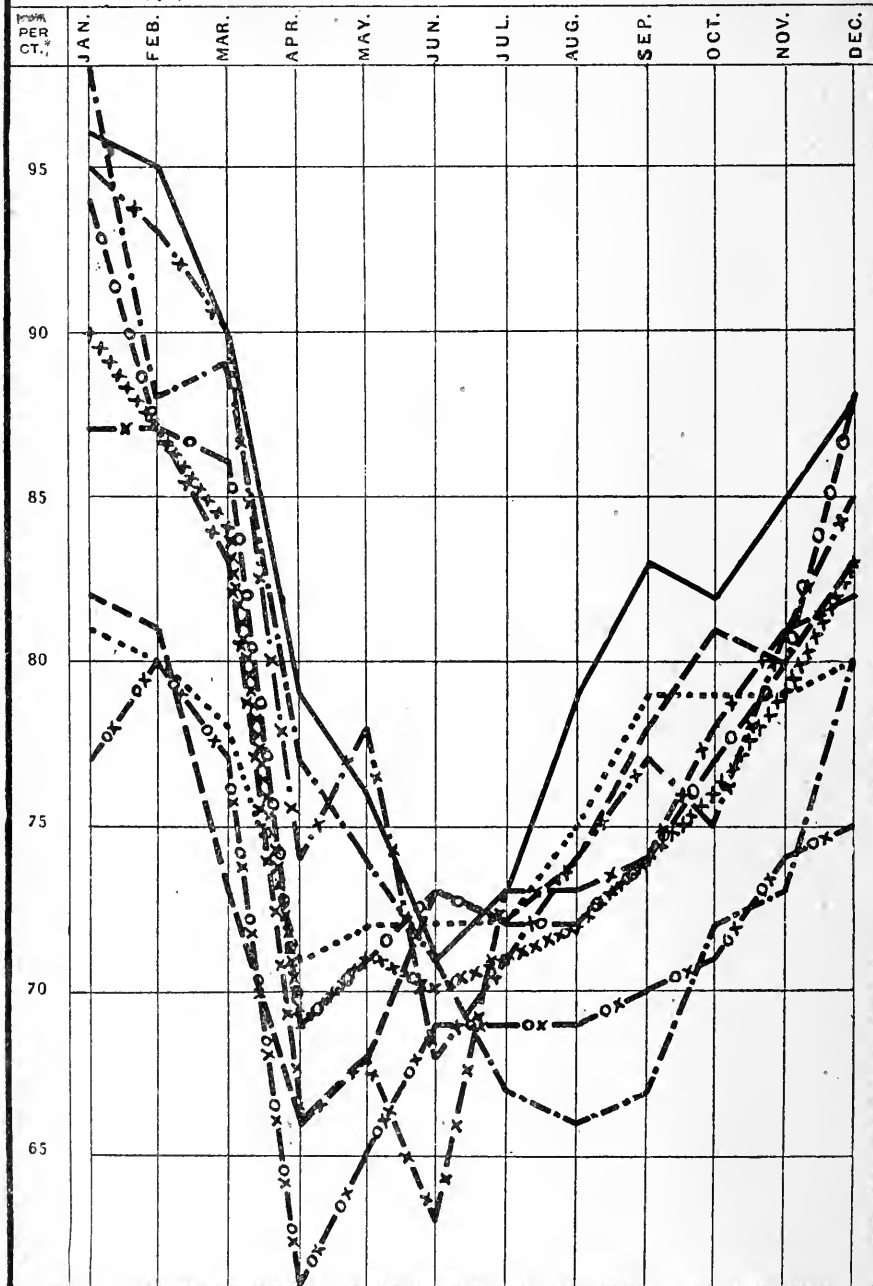
§§ At Marquette a whirling psychrometer was used in 1888.

[The remaining foot-notes are on page 25.]

The lines for 6 stations in Table IV. are graphically represented in Diagram III., page 28.

DIAGRAM IV.—RELATIVE HUMIDITY, BY MONTHS, 1888.

PER CENT OF SATURATION OF AIR.—AT STATIONS IN MICHIGAN:  
 ANN ARBOR—x, BIRMINGHAM—, GULLIVER LAKE—, KALAMAZOO—, LANSING—ox, THORNVILLE—o, TRAVERSE CITY—x; AV. FOR 9 STATIONS xxxxxxx. AV. FOR 5 STATIONS—.



SCALE, TEN PER CENT OF SATURATION TO 1.72 IN. VERTICALLY.



TABLE V.—RELATIVE HUMIDITY.—Average Per Cent of Saturation of the Atmosphere with Vapor of Water during the Year, and during each Month of the Year 1888, at 16 Stations in Michigan; also Average lines for 9 Stations and for 5 Stations.—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,\* by Observers† for the State Board of Health, and for the U. S. Signal Service.

Stations in Michigan.†	Divisions of the State.††	Per Cent of Saturation.—Relative Humidity.													
		Year.		Months, 1888.											
		Norm. §	1888.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 9 Stations	-----	-----	77	90	87	84	69	71	70	71	72	74	76	79	83
Av. for 5 Stations	-----	-----	77	81	80	78	71	72	72	72	75	79	79	79	80
Marquette.....††	U. P.	<sup>3</sup> 76	76	72	<sup>g</sup> 75	74	77	73	73	75	77	77	79	80	79
Gulliver Lake....	U. P.	<sup>2</sup> 83	83	96	<sup>g</sup> 95	90	79	76	71	73	79	83	82	85	88
Traverse City....	N. W.	<sup>7</sup> 83	80	95	93	90	74	78	68	71	74	77	75	81	85
Alpena.....	N. E.	<sup>10</sup> 77	79	82	80	83	78	79	71	72	73	81	83	82	86
Harrisville.....	N. E.	<sup>10</sup> 61	58	59	60	59	58	60	62	63	67	59	62	61	
Grand Haven.....	W.	<sup>10</sup> 76	77	88	87	81	<sup>h</sup> 68	<sup>f</sup> 72	74	<sup>i</sup> 71	<sup>b</sup> 76	<sup>i</sup> 78	<sup>f</sup> 77	79	78
Port Austin.....	B. & E.	<sup>10</sup> -----	**	-----	-----	-----	80	76	74	73	77	79	79	-----	-----
Port Huron.....	B. & E.	<sup>11</sup> 77	77	84	81	78	69	72	73	73	78	79	77	78	77
Thornville.....	B. & E.	<sup>25</sup> 79	79	94	87	86	69	71	73	72	72	74	77	80	88
Agr'l College....	C.	<sup>10</sup> 79	76	89	85	79	61	68	72	71	71	71	76	82	83
Lansing, S. B. of H.....††	C.	<sup>8</sup> 72	71	77	80	77	61	65	69	69	69	70	71	74	75
Ann Arbor.....	S. C.	<sup>3</sup> 78	76	87	87	83	66	68	<sup>f</sup> 63	73	73	<sup>d</sup> 74	78	81	<sup>e</sup> 82
Battle Creek.....	S. C.	<sup>7</sup> -----	88	92	93	<sup>a</sup> 93	83	85	<sup>a</sup> 84	84	84	86	90	92	<sup>a</sup> 93
Kalamazoo.....	S. C.	<sup>7</sup> 76	77	98	<sup>a</sup> 88	89	77	74	71	67	66	67	72	73	80
Marshall.....	S. C.	<sup>2</sup> 77	76	94	<sup>g</sup> 83	85	65	71	71	<sup>b</sup> 70	<sup>b</sup> 67	73	<sup>c</sup> 75	77	<sup>a</sup> 83
Birmingham.....	S. E.	<sup>11</sup> 76	76	82	<sup>g</sup> 81	73	66	68	73	72	74	78	81	<sup>g</sup> 80	83
Detroit.....	S. E.	<sup>11</sup> 72	74	81	77	74	63	64	68	69	70	80	80	78	79

NOTE.—The observations with the psychrometer at Marquette, Grand Haven, Port Huron and Detroit for 1888 were reduced (by tables in "Signal Service Order No. 41, 1881, and in Instructions to Voluntary Observers," 1882), and the monthly means for those months were computed, by the observers at those stations. In all other cases the observations were reduced by Guyot's table, in Smithsonian Meteorological Tables, or by a table substantially the same as that. Computations for Ann Arbor for each month in 1888 were made by the observers there. All other computations in Table V. were made at the office of the State Board of Health.

\* At the stations of the U. S. Signal Service for the first six months of the year 1888, the observations were made at 7 A. M., 3 P. M., and 10 P. M., 75th meridian time; and for the last six months at 8 A. M. and 8 P. M., 75th meridian time. The corresponding local time for each of these stations is stated in the star (\*) foot-note to Table I., page 19.

† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit I., page 2.

†† The full names of the divisions and the counties in each division are stated in Exhibit I., in a paper which follows, on weekly reports of sickness.

§ Numbers in this column state the average annual Relative Humidity for periods of years ending in each case with Dec. 31, 1888. The small figures above and at the right of the numbers which state the Relative Humidity, denote the number of years included in the average.

|| This line is an average for only the stations at which observations were made tri-daily and from which statements, nearly complete, were received for every month in the year. It does not include Harrisville, Battle Creek, and the U. S. Signal Service Stations.

†† This line is an average for the 5 U. S. Signal Service Stations.

\*\* The average for 7 months in 1888 is 77.

|| The remaining foot-notes are on page 21.]

Graphic representations of 9 representative lines in Table V. are given in Diagram IV., page 30.

**EXHIBIT 13.**—Average Relative Humidity, by Year and Months, in 1888,\* compared with Annual and Monthly Averages for 1887, and for the Ten Years 1878-87. These Averages are for Groups of several Stations in Michigan.

Years, etc.	Per Cent of Saturation.—Relative Humidity.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 years, 1878-87†	76	81	80	77	70	68	72	72	74	75	76	79	83
1887 (16 stations).....	77	77	85	79	74	70	75	70	71	75	76	78	86
1888 (9 stations).....	77	90	87	84	69	71	70	71	72	74	76	79	83
In 1888 <b>Greater</b> than Av. for 10 years, 1878-87.....	1	9	7	7	.....	3	.....	.....	.....	.....	.....	.....	.....
In 1888 <b>Less</b> than Av. for 10 years, 1878-87.....	.....	.....	.....	.....	1	.....	2	1	2	1	0	0	0
In 1888 <b>Greater</b> than in 1887.....	0	13	2	5	.....	1	.....	1	1	.....	0	1	.....
In 1888 <b>Less</b> than in 1887.....	.....	.....	.....	.....	5	.....	5	.....	.....	1	.....	.....	3

\* Beginning with the year 1885, allowance must be made for Lansing in Exhibit 13, because of a change in the location of instruments. The amount of the variation is shown in Exhibit D, on page 23, Report for 1886.

† Thornville and Detroit for 1878-87; Kalamazoo for 1878-83 and 1886-7; Mendon for 1878-82; Tecumseh for 1878-85; Otisville for 1878-80 and 1882; Nirvana and Woodmere Cemetery (near Detroit) for 1878-9; Nirvana and Reed City for 1880; Ann Arbor for 1881-7; Niles for 1878-9 and 1881; Marquette for 1879-84 and 1886-7; Alpena, Grand Haven, Port Huron, Lansing for 1879-87; Agricultural College for 1881-7; Escanaba for 1880-7; Washington for 1880-3; Coldwater for 1878; Petoskey for 1879; Mallore Lake and Hudson for 1881; Marshall, Traverse City for 1882-7; Hillsdale for 1882-4; Hastings for 1882; Harrisville for 1882 and 1885-6; Winfield for 1883; Reed City for 1881-5; Battle Creek for 1878-9, 1882, 1885; Manistique, Swartz Creek for 1884-5; Mackinaw City for 1884-7; Ionia for 1884; Pentwater for 1886; Gulliver Lake and Birmingham for 1887.

**EXHIBIT 14.**—Comparison of the Average Relative Humidity of the Air (Per Cent of Saturation) for the Year and for each Month of the Year 1888, with Averages for the 24 Years 1864-87, and for 1887. Observations made at 7 A. M., 2 P. M., and 9 P. M. Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.

Years, etc.	Per Cent of Saturation,—Relative Humidity.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
A. for 24 years, 1864-87.....	79	87	86	84	71	69	76	73	76	80	79	82	87
1887.....	76	90	89	78	66	68	73	65	66	75	75	80	87
1888.....	76	89	85	79	61	68	72	71	71	71	76	82	83
In 1888 <b>Greater</b> than Av. for 24 years, 1864-87.....	-----	2	-----	-----	-----	-----	-----	-----	-----	-----	-----	0	-----
In 1888 <b>Less</b> than Av. for 24 years, 1864-87.....	3	-----	1	5	10	1	4	2	5	9	3	0	4
In 1888 <b>Greater</b> than in 1887.....	0	-----	-----	1	-----	0	-----	6	5	-----	1	2	-----
In 1888 <b>Less</b> than in 1887.....	0	1	4	-----	5	0	1	-----	-----	4	-----	-----	4

## DIAGRAMS RELATING TO METEOROLOGICAL CONDITIONS.

Most of the diagrams in this paper are to be read by tracing each irregular line across the diagram from left to right, and noting at what point it intersects each of the perpendicular lines having the name of the month at the top. What station is represented by the irregular line may be learned from the head of the diagram. The degree of value denoted by the intersection may be learned by referring to the figures in the left-hand column. Thus, in Diagram I., page 18, relating to average temperature in 1888, tracing the line "-----" representing Gulliver Lake, it may be seen that the average temperature at Gulliver Lake was, in January, about  $10^{\circ}$ , in February,  $13^{\circ}$ , in May about  $46^{\circ}$ , in July about  $64^{\circ}$ , in October about  $42^{\circ}$ , etc. Definite numerical statements of the average temperature for each month at each station may be found in Table I., page 19, and accompanying each diagram is a table giving exact numerical statements for the conditions represented. The average line given in each table is represented in the corresponding diagram by an  $\times$  line, thus  $\times \times \times \times \times$ . The lines in the diagrams give more ready general comparisons of stations with each other, or of months with each other, than is possible from the mere numerical statements. By Diagram II., page 24, it appears at a glance that the average daily range of temperature at Gulliver Lake and Traverse City, in 1888, was, during June, higher than at any other of the ten stations represented in that diagram, and during December was lower at Thornville. The marked agreement in the course of the lines in Diagram I., page 18, representing mean monthly temperature at seven stations, and also that the agreement is closer in the last four months of the year than in earlier months, appear at once on reference to the diagram. The resemblance between the lines in Diagram I., page 18, relating to mean temperature by months in 1888, and those in Diagram III, page 28, relating to absolute humidity of the atmosphere for the same periods, is apparent. By Diagram X., page 59, it appears that in every month of the year the highest velocity of the wind (on an average for the month) is reached between 1 P. M. and 3 P. M., and that the lowest velocity occurs in the latter part of the night or in early morning, and that in 1888, at Lansing, the months of most wind were March, April and December. By reference to Diagram XI., page 61, it may be seen that at other stations in Michigan where records of actual miles of wind traveled were kept, March and December were, in 1888, the months of greatest wind. These statements illustrate the reading of the diagrams for any use it may be desired to make of the tables and diagrams. The three diagrams relating to direction of the wind are constructed on a different principle and the manner of reading them is explained on pages following in this article.

## FOGS.

For the year 1888, fog was reported at 112 morning observations, at 24 afternoon observations (at about 2 P. M.), at 47 evening observations (at about 9 P. M.), and 36 times during the day, no special time being mentioned, in many cases the same fog or fog at the same time, being reported by different observers. Fog was reported, at one or more stations at some time during the day, on 105 days.

EXHIBIT 15.—*Number of Different Days on which Fog was Observed at One or more of 17 Stations in Michigan\* in 1888, and in each month of the Year 1888.*

Year, 1888.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
105	5	9	8	5	12	12	16	10	15	4	1	8

NOTE.—Graphic representations of statements in Exhibit 15 are given in Diagram V., page 35.

\* This Exhibit contains statements only for those localities from which reports were received for every month of the year, as follows: Marquette, Gulliver Lake, Traverse City, Alpena, Grand Haven, Port Austin, Port Huron, Thornville, Lansing, Agricultural College, Ann Arbor, Battle Creek, Kalamazoo, Marshall, Parkville, Birmingham and Detroit.

EXHIBIT 16.—*Number of Observations at which Fog was Observed in Michigan in 1888, and in each Month of the Year 1888. (Observations taken 3 times Daily,\* at 17 Stations.†)*

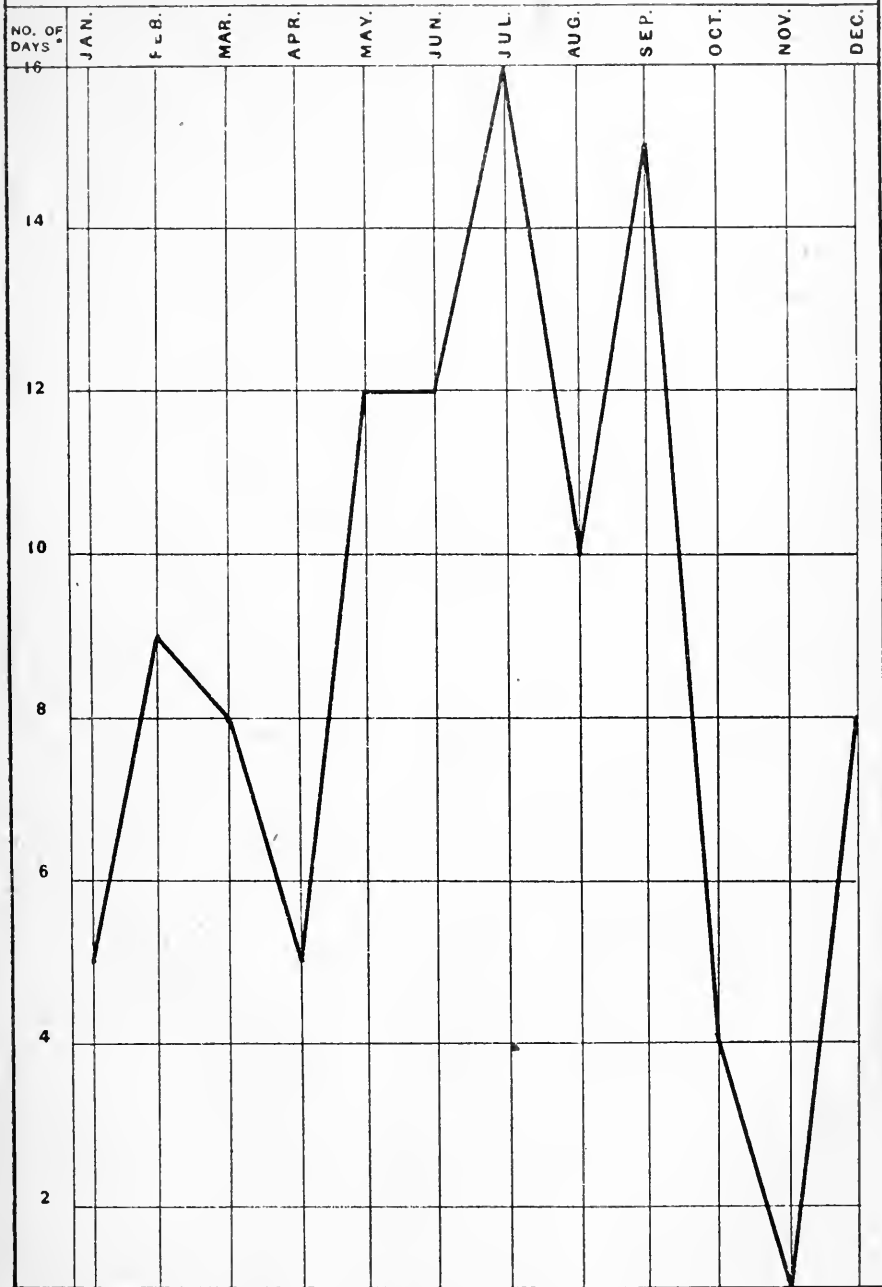
Year, 1888.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
219	20	18	11	6	39	26	24	18	34	8	2	13

\* At the U. S. Signal Service Stations the observations were made at 8 A. M. and 8 P. M., 75th Meridian time.

† This exhibit contains statements only for those localities from which registers were received for every month of the year; the localities are stated in a foot-note to Exhibit 15, above.

DIAGRAM V.—CONCERNING FOGS IN MICHIGAN, IN 1888.

NUMBER OF DIFFERENT DAYS ON WHICH FOG WAS OBSERVED AT ONE OR MORE OF SIXTEEN STATIONS IN MICHIGAN, BY MONTHS, IN 1888.



SCALE, ONE DAY TO .42 IN. VERTICALLY.

EXHIBIT 17.—*Number of different Days on which Fog was recorded in 1888, and in each*

Stations in Michigan.*	No. of Days in 1888.	January.		February.		Line Number.
		Day of Month.	Hour of Observation.	Day of Month.	Hour of Observation.	
			A. M. P. M.		A. M. P. M.	
Marquette.....	19	0	-----	0	-----	1
-----	-----	-----	-----	-----	-----	2
-----	-----	-----	-----	-----	-----	3
Gulliver Lake.....	15	30	----- 9:00	2	7:00	4
-----	-----	-----	-----	-----	-----	5
-----	-----	-----	-----	-----	-----	6
Traverse City.....	7	0	-----	24	7:00	7
-----	-----	-----	-----	-----	-----	-----
Alpena.....	13	0	-----	20	7 till 10 Night.	8
-----	-----	-----	-----	-----	-----	9
-----	-----	-----	-----	-----	-----	10
-----	-----	-----	-----	-----	-----	11
Grand Haven.....	43	30	2:15 & 9:15	11, 19, 21, 23	----- 9:15	12
-----	-----	31	9:15	-----	-----	13
-----	-----	-----	-----	-----	-----	14
Port Austin.....	2	0	-----	0	-----	15
-----	-----	-----	-----	-----	-----	-----
Port Huron.....	16	6, 31	----- 2:30	3, 19	----- 2:30	16
-----	-----	-----	-----	19	9:30	17
Thornville.....	11	6, 31	-----	0	-----	18
Agricultural College	9	6	----- 2:00	3	7:00	19
Lansing, S. B. of H. }	14	6	10 till	3	Early	20
-----	-----	15	Early	4	-----	21
Ann Arbor.....	4	0	-----	3	7:00	22
Battle Creek.....	3	0	-----	0	-----	23
-----	-----	-----	-----	-----	-----	-----
Kalamazoo.....	7	30	----- 9:00	3	7:00	24
-----	-----	-----	-----	19	9:00	25
Parkville.....	26	6, 27, 30, 31	-----	3, 18	-----	26
-----	-----	-----	-----	-----	-----	-----
Birmingham.....	9	30	----- 9:00	0	-----	27
-----	-----	31	2:00 & 9:00	-----	-----	28
-----	-----	-----	-----	-----	-----	-----
Detroit.....	9	30	----- 9:28	0	-----	29
-----	-----	-----	-----	-----	-----	30

\* The names of observers, their places of observation, and the counties in which the places are situated, are stated in Exhibit 1, page 2.

*Month, the dates and hours of observation† when Fogs were recorded, at 18 Stations in Michigan.*

Line Number.	March.			April.			May.			June.		
	Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.	
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.
1	0			28	6:11		9	6:11	2:11	10, 30	6:11	
2							9, 21, 25		9:11	9		2:11&9:11
3							11, 12, 22, 23			24		9:11
4	0			0			9		2 & 9	14, 21, 22	7:00	
5							10	7:00		9		2 & 9
6										13, 14		9:00
7	0			0			26, 28	7:00		0		
8	0			0			8		9:00	13		8 till
9							9	7:00	till 3:10	14	Morn till	Night
10							26	5:25	Night			
11							28	5:30	Night			
12	2	6:15		10, 28	6:15		20, 26, 28	6:11		15, 16, 17, 24	6:11	
13	10, 19, 29		9:15	3, 26		9:15	8		2:11&9:11	13		2:11
14							25		9:11	13, 15		9:11
15	0			0			10	7:00		0		
16	15, 20	6:30		0			9, 29	6:30		14	6:30	
17	27		2:30				8		2:30&9:30			
18	2	A. M.		0			8	7:00	2 & 9	0		
19	0			0			0			0		
20	2	Still	11	0			0			0		
21												
22	2	7:00	2:00	0			8		9:00	0		
23	0			0			0			0		
24	0			0			26, 29	7:00		0		
25												
26	1, 10			0			20, 26, 29			3, 16, 30		
27	0			2		2:00	0			0		
28												
29	0			0			8		9:28	0		
30							9	6:28				

† At the U. S. Signal Service Stations for the first six months in 1888, the observations were made at 7 A. M., 3 P. M., and 10 P. M., 75th Meridian time; and for the last six months at 8 A. M. and 8 P. M., 75th Meridian time.

NOTE.—Registers were received, but with no fog recorded thereon, from Harrisville, Otsego, Hudson, Marshall and Tecumseh, for each month in 1888. A cipher (0) indicates that a monthly register was received from the station with no fog recorded thereon.

EXHIBIT 17.—CONTINUED.—*Dates when*

Stations in Michigan.	July.			August.			September.			Line Number.
	Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.	
Marquette.....	9, 29	6:11		0			15, 22		6:11	1
	26		6:11				16	6:11		2
Gulliver L'ke.....	3, 22	7:00		7	2 till 7		21	6:11	6:11	3
	17		3 till 6	7	11:30 till	6	24	7:00		4
Manistee.....				29	7:00					5
				7	{ night till 6:30 }		1	5:30 till 6:25		6
				12	{ night till 6:30 }		13	7:15		7
				13	{ night till 8:45 }		20	3 till 8:45		8
							21	{ night till 8:45 }		9
							22	{ night till 9:10 }		10
							23	4:10 till 9:30		11
							24	{ night till 7:40 }		12
Traverse City.....	9, 15	7:00		0			0			13
Alpena.....	8		9:00							14
	26		7 P. M. till	0			14	Early till	12:13	15
	27	Morn. till	Midnight.				19		11:00*	16
	28		Night.				22		Night.†	17
Gd. Haven.....	8, 20, 28	6:15		15, 30	6:15		{ 3, 10, 13 } { 15, 20, 23 }	6:15		18
Port Austin.....	9, 16		6:15	29		6:15	14	6:15	6:15	19
Port Huron.....	0			4	7:00		0			20
	27	6:30		6	6:30		0			21
Thornville.....	0			0			{ 1, 15, 19 } { 20, 22, 24 }	Morning.		22
Agr'l College Lansing, S. B. of H.....	0			28, 30, 31	7:00		14, 20, 22, 24	7:00		23
	27, 28	7:00		28, 30	7:00		14, 20, 22, 24	7:00		24
Ann Arbor.....	0			0			0			25
Battle Creek.....	0			0			0			26
Kalamazoo.....	27	7:00		0			0			27
Parkville.....	{ 6, 10, 15 } { 18, 23, 27 }			5, 7, 13			{ 13, 14, 19 } { 20, 21, 23, 24 }	Morning ‡		28
Birmingham.....	0			6, 7	7:00		1, 16, 20	7:00		29
Detroit.....	0			0			26, 30		6:28	30

\* Lifted in night.

† Formed and lifted during night.

‡ On low lands.



*Fogs were recorded in 1888.*

Line Number.	October.			November.			December.		
	Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.	
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.
1	0			0			0		
2									
3									
4	0			0			0		
5									
6									
7	14	{ night till }		0			0		
8		8:45 }							
9									
10									
11									
12									
13									
14	14	7:00		0			0		
15									
16	0			0			0		
17									
18									
19									
20	14, 23	6:15		15	6:15		10	6:15	
21									
22	0			0			0		
23	23	8 till 11		0			8		2:35*
24							17	{ night till }	
25								10:00 }	
26	0			0			26	{ night till }	
27	0			0				10:30 }	
28	7		9:00	0			26	till 10:00	
29	0			0			0		
30	0			0			23, 25, 31		
31	23	7:00		0			0		
32	23			15			9		
33	0			0			9	7:00	
34	19, 23	6:28		0			9, 26	6:28	

TABLE VI.—Average Per Cent of Cloudiness for the Year, and for each Month of the Year 1888, at each of 16 Stations in Michigan, and also the Average lines for 11 Stations, and for 5 Stations. Average of Observations made Daily at 7 A. M., 2 P. M. and 9 P. M., \* by Observers for the State Board of Health, † and for the U. S. Signal Service.

Stations in Michigan.†  (Those of the U. S. Signal Service in Italics.)	Division of the State.‡	Average Per Cent of Cloudiness.													
		Year.		Months, 1888.											
				Norm. 	1888.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.
		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Av. for 11 Stations§	-----	-----	57	75	64	58	47	64	43	45	45	40	67	64	73
Av. for 5 Stations¶	-----	-----	60	71	67	61	51	63	51	51	48	42	71	70	75
Marquette.....	U. P.	59 <sup>3</sup>	61	69	70	48	55	64 <sup>c</sup>	53 <sup>i</sup>	48 <sup>a</sup>	44	53	74	76	80
Gulliver Lake....	U. P.	53 <sup>2</sup>	55	61	63	45	50	67 <sup>e</sup>	38 <sup>f</sup>	47 <sup>f</sup>	38	46 <sup>d</sup>	64 <sup>a</sup>	65	71 <sup>a</sup>
Traverse City....	N. W.	60 <sup>7</sup>	62	68	74	53	49	67 <sup>r</sup>	37	41	46	48	72	76	88
Alpena.....	N. E.	58 <sup>10</sup>	63	69	72	63	51	70	48	50	52	49	78	78	80
Harrisville.....	N. E.	59 <sup>4</sup>	58	67	69	57	41	70	46	37	43	41	70	78	79
Grand Haven.....	W.	59 <sup>10</sup>	65	91	78	69	53	64 <sup>p</sup>	57 <sup>o</sup>	57	52	44 <sup>g</sup>	69 <sup>k</sup>	63	77 <sup>l</sup>
Port Austin.....	B. & E.	----- <sup>10</sup>	42	51	58	38	31	44	14	13	25	33	69	64	69
Port Huron.....	B. & E.	57 <sup>19</sup>	55	56	57	63	44	57	42	41	47	33	66	73	75
Thornville.....	B. & E.	52 <sup>25</sup>	51	69	57	54	39	57	35	36	40	28	68	58	68
Agr'l College.....	C.	58 <sup>10</sup>	58	77	64	62	49	64	44	43	42	45	70	62	72
Lansing, S. B. of H.....	C.	56 <sup>3</sup>	59	77 <sup>a</sup>	64 <sup>m</sup>	62 <sup>a</sup>	53	64 <sup>e</sup>	49 <sup>j</sup>	50 <sup>c</sup>	48 <sup>d</sup>	41 <sup>e</sup>	71	61	72
Otsego.....	S. W.	40 <sup>9</sup>	39	67	48	51	34	56	24	21	21	22	40	41	46
Ann Arbor.....	S. C.	59	61	76	61	61	50	66	56	58	54	46	68	63	73 <sup>a</sup>
Battle Creek.....	S. C.	----- <sup>12</sup>	53	77	63	59	43	60	33	37	45	35	59	56	67
Kalamazoo.....	S. C.	66 <sup>8</sup>	58	90	69	67	44	62	43	46	46	34	61	59	76
Marshall.....	S. C.	55 <sup>2</sup>	55	76 <sup>f</sup>	60 <sup>k</sup>	65 <sup>b</sup>	44 <sup>e</sup>	61 <sup>a</sup>	40 <sup>d</sup>	47 <sup>h</sup>	40 <sup>i</sup>	37 <sup>l</sup>	62 <sup>g</sup>	58 <sup>r</sup>	65 <sup>a</sup>
Birmingham.....	S. E.	59 <sup>10</sup>	59	66	64	58	50	63	51	54	48	41	70	65	75
Detroit.....	S. E.	56	58	72	59	63	52	62	54	62	47	32	66	59	63

\* At Stations of the U. S. Signal Service, for the first six months of the year 1888, the observations were made at 7 A. M., 3 P. M., and 10 P. M., 75th meridian time; and for the last six months at 8 A. M., and 8 P. M., 75th meridian time. The corresponding local time for each of the stations is stated in the star (\*) foot note to Table I., page 19.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit I., page 2.

‡ The full names of divisions and the counties in each division are stated in Exhibit I. in a paper which follows on weekly reports of sickness.

§ Numbers in this column state the average per cent of cloudiness for periods of years ending in each case with Dec. 31, 1888. The small figures above and at the right of numbers which state the per cent of cloudiness, denote the number of years included in the average.

NOTE TO TABLE VI.—Computations of average per cent of cloudiness were made and furnished by the observers at Ann Arbor, Grand Haven and Alpena for each month in 1888. At Port Huron, Jan. to May; at Detroit, May to Dec. All other computations in Table VI. were made at the office of the State Board of Health.

§ This line is an average for only the stations at which tri-daily observations were made and from which statements, nearly complete, were received for every month of the year. It does not include the line for Otsego and Port Austin.

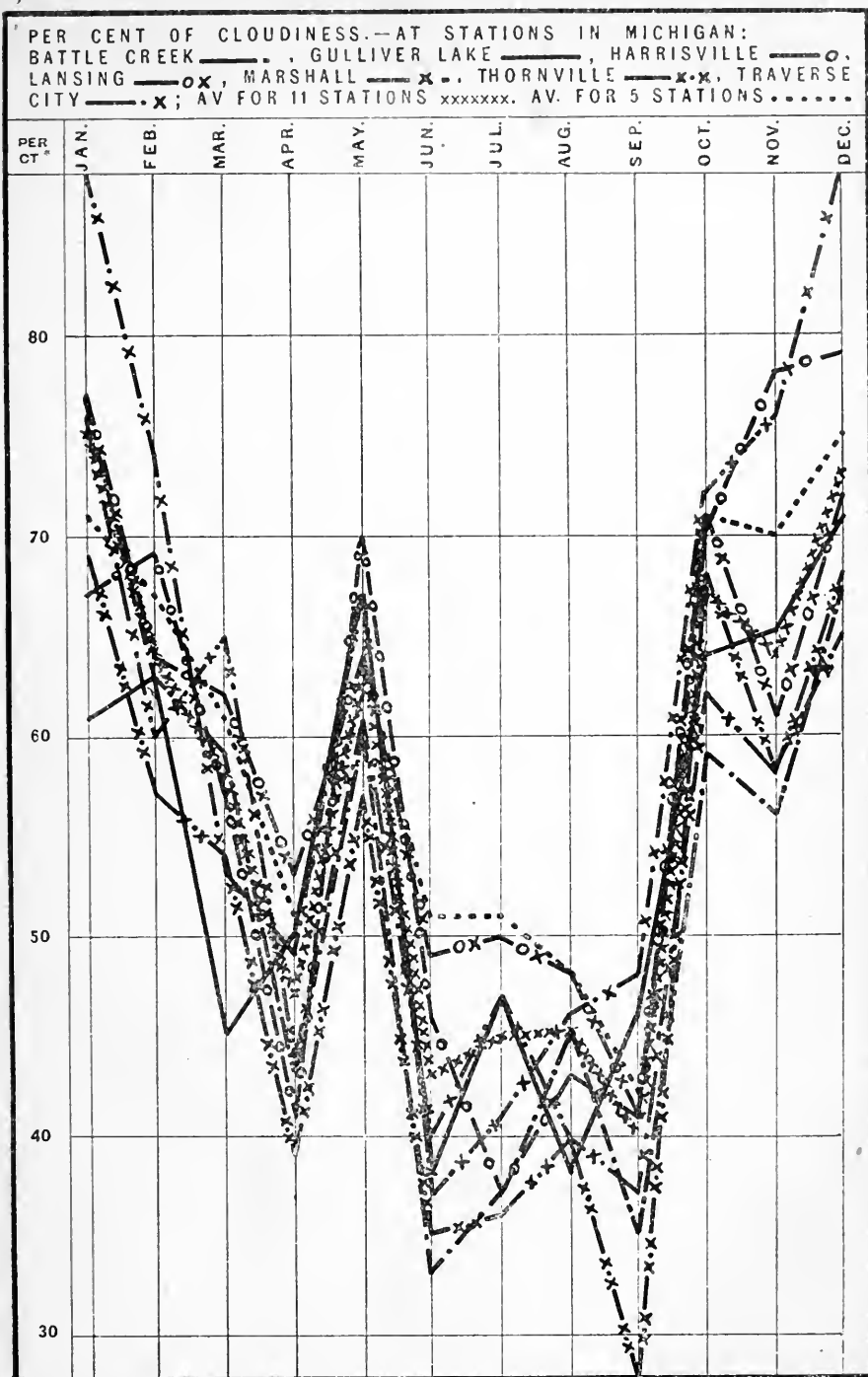
¶ This line is an average for the five U. S. Signal Service Stations.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

[The remaining foot-notes are on page 43.]

Graphic representations of 9 representative lines in Table VI., are given in Diagram No. VI., page 41.

DIAGRAM VI.—AV. PER CT. OF CLOUDINESS, MONTHS. 1888.



\*SCALE, TEN PER CENT TO 1.06 IN. VERTICALLY.

**EXHIBIT 18.**—Average Per Cent of Cloudiness, by Year and Months, in 1888, Compared with Annual and Monthly Averages for 1887, and for the Eleven Years 1877-87. These Averages are for Groups of several Stations in Michigan.

Years, etc.	Per Cent of Cloudiness.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 11 years, 1877-87*	56	69	63	59	52	47	47	41	44	46	57	68	77
1887 (17 stations)....	56	70	72	51	56	38	49	36	45	49	63	64	83
1888 (11 stations)....	57	75	64	58	47	64	43	45	45	40	67	64	73
In 1888 <b>Greater</b> than Av. for 11 years, 1877-87.....	1	6	1	-----	-----	17	-----	4	1	-----	10	-----	-----
In 1888 <b>Less</b> than Av. for 11 years, 1877-87.....	-----	-----	-----	1	5	-----	4	-----	-----	6	-----	4	4
In 1888 <b>Greater</b> than in 1887.....	1	5	-----	7	-----	26	-----	9	0	-----	4	0	-----
In 1888 <b>Less</b> than in 1887.....	-----	-----	8	-----	9	-----	6	-----	-----	9	-----	-----	10

\* Thornville, Kalamazoo for 1877-87; Mendon for 1877-83; Tecumseh for 1877-85; Battle Creek for 1877-80 and 1882-85; Nirvana for 1877-9 and the first four months of 1880; Reed City for last eight months of 1880, and 1881-5; Detroit for 1877 and 1879-87; Niles for 1878-81; Benton Harbor for 1877-8 and 1880; Coldwater, Woodmere Cemetery (near Detroit) for 1877-9; Otisville for 1878-80 and 1882; Marquette for 1879-84 and 1886-7; Alpena, Grand Haven, Port Huron, Lansing for 1879-87; Washington for 1879-83; Ypsilanti for 1877 and 1879; Agricultural College for 1877 and 1881-7; Petoskey for 1878-9; Escanaba, Ann Arbor for 1880-7; Fife Lake for 1877; Ionia for 1880 and 1883-5; Adrian for 1880; Hillsdale for 1880 and 1882-4; Marshall for 1881-7; Parkville for 1881-2; Winfield for 1881 and 1883; Hudson and Mallory Lake for 1881; Harrisville for 1882 and 1883-7; Hastings for 1882; Traverse City for 1882-7; Port Austin for 1883; Manistique, Swartz Creek for 1884-5; Mackinaw City for 1884-7; Pentwater, East Saginaw for 1886; Otsego for 1886-7; Gulliver Lake and Birmingham for 1887.

**EXHIBIT 19.**—Comparison of the Average Per Cent of Cloudiness in the Year and each Month of the Year 1888, with Averages for the Twenty-four Years, 1864-87, and for the Year 1887. Observations made at 7 A. M., 2 P. M., and 9 P. M., Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich.

Years, etc.	Per Cent of Cloudiness.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 24 years, 1864-87.	58	73	64	62	56	50	50	46	47	49	58	67	76
1887.....	55	71	78	54	58	36	47	36	48	48	60	55	74
1888.....	58	77	64	62	49	64	44	43	42	45	70	62	72
In 1888 <b>Greater</b> than average for 24 years, 1864-87....	0	4	0	0	-----	14	-----	-----	-----	-----	12	-----	-----
In 1888 <b>Less</b> than average for 24 yrs., 1864-87.....	0	-----	-----	-----	7	-----	6	3	5	4	-----	5	4
In 1888 <b>Greater</b> than in 1887.....	3	6	-----	8	-----	28	-----	7	-----	-----	10	7	-----
In 1888 <b>Less</b> than in 1887.....	-----	-----	14	-----	9	-----	3	-----	6	3	-----	-----	2

EXHIBIT 20.—*Dates of Auroras Observed and Recorded at 10 Stations in Michigan during the Year 1888.*

Stations.	Dates of Auroras Recorded in 1888.											
	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Marquette.....				2, 5, 10, 11, 30	7							
Gulliver Lake.....	11	8, 17	7, 16, 17	2, 5, 10, 11, 30	2, 7					31		6, 8
Traverse City.....						2				31	6	
Alpena.....			17	2, 11	7		1	3				
Grand Haven.....			7	2, 11	20					30		
Thornville.....				2, 11	20							
Lansing, S. B. of H..	10			2, 12	21					30		
Ann Arbor.....		8		2, 11	20							
Kalamazoo.....					3							
Birmingham.....				11								

## SUNSHINE AND CLOUDS.

The following is a statement of the days in each month in 1888, which were "All or nearly all sunshine," "Clear," "Fair," "Partly cloudy," "All or nearly all cloudy," and the hours of sunshine during each month, as reported by observers at stations in Michigan :

## ALPENA.

JAN.—Sunny, 10, 11, 15, 16, 20, 21, 22, 27, 28—9 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 14, 17, 18, 19, 23, 24, 25, 26, 29, 30, 31—22 days.

FEB.—Sunny, 8, 9, 11, 14, 15, 16, 20, 21, 24, 27, 29—11 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 10, 12, 13, 17, 18, 19, 22, 23, 25, 26, 28—18 days.

MARCH.—Sunny, 3, 4, 5, 7, 8, 11, 12, 13, 14, 17, 23, 24, 31—13 days. Cloudy, 1, 2, 6, 9, 10, 15, 16, 18, 19, 20, 21, 22, 25, 26, 27, 28, 29, 30—18 days.

APRIL.—Sunny, 5, 6, 7, 8, 9, 11, 12, 15, 16, 19, 21, 22, 24, 27, 28—15 days. Cloudy, 1, 2, 3, 4, 10, 13, 14, 17, 18, 20, 23, 25, 26, 29, 30—15 days.

MAY.—Sunny, 6. Cloudy, 3, 4, 8, 9, 11, 12, 13, 15, 17, 18, 25, 27—12 days. No record for the rest of the month.

JUNE.—Sunny, 2, 3, 4, 5, 7, 8, 11, 12, 13, 15, 16, 18, 19, 24, 26, 29, 30—17 days. Cloudy, 1, 6, 9, 10, 14, 7, 20, 21, 22, 23, 25, 27, 28—13 days.

JULY.—Sunny, 1, 3, 4, 5, 13, 16, 21, 24, 25, 27—10 days. Cloudy, 2, 6, 7, 8, 9, 10, 11, 12, 14, 15, 17, 18, 19, 20, 22, 23, 26, 28, 29, 30, 31—21 days.

AUG.—Sunny, 5, 9, 10, 12, 13, 17, 18, 19, 20, 22, 25, 27, 28—13 days. Cloudy, 1, 2, 3, 4, 6, 7, 8, 11, 14, 15, 16, 21, 23, 24, 26, 29, 30, 31—18 days.

SEPT.—Sunny, 1, 2, 6, 7, 9, 10, 13, 22, 23, 24—10 days. Cloudy, 3, 4, 5, 8, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 25, 26, 27, 28, 29, 30—20 days.

OCT.—Sunny, 9, 10, 14—3 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31—28 days.

NOV.—Sunny, 3, 6, 7, 13, 26—5 days. Cloudy, 1, 2, 4, 5, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 30—25 days.

DEC.—Sunny, 1, 6, 9, 22, 23, 28, 29—7 days. Cloudy, 2, 3, 4, 5, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 24, 25, 26, 27, 30, 31—24 days.

Foot-notes to Table VI., from page 40.]

a For 92 observations.	b For 91 observations.	c For 90 observations.	d For 89 observations.
e For 87 observations.	f For 86 observations.	g For 85 observations.	h For 84 observations.
i For 83 observations.	j For 82 observations.	k For 81 observations.	l For 80 observations.
m For 79 observations.	n For 78 observations.	o For 75 observations.	p For 71 observations.
q For 67 observations.	r For 63 observations.	s For 55 observations.	

## THORNVILLE.

JAN.—Sunny, 11, 16, 21, 22, 24, 26, 27, 28—8 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 12, 13, 14, 17, 18, 19, 23, 25, 29, 30, 31—18 days. No record for the rest of the month.

FEB.—Sunny, 9, 11, 12, 13, 15, 16, 18, 22, 23, 24, 29—11 days. Cloudy, 1, 2, 3, 4, 6, 7, 10, 14, 19, 20, 21, 25, 27—13 days. No record for the rest of the month.

MARCH.—Sunny, 6, 7, 8, 12, 13, 14, 15, 17, 18, 19, 23, 24, 31—13 days. Cloudy, 2, 3, 4, 10, 16, 20, 22, 25, 26, 27, 28, 30—12 days. No record for the rest of the month.

APRIL.—Sunny, 3, 4, 6, 7, 8, 11, 12, 16, 18, 21, 22, 24, 25, 26, 27, 28, 29—17 days. Cloudy, 1, 5, 10, 15, 17, 19, 20, 30—8 days. No record for the rest of the month.

MAY.—Sunny, 1, 2, 3, 5, 6, 9, 10, 11, 16, 17, 20, 21, 22, 23, 29, 30, 31—17 days. Cloudy, 4, 7, 8, 13, 14, 18, 25, 28—8 days. No record for the rest of the month.

JUNE.—Sunny, 2, 3, 4, 5, 6, 7, 8, 12, 15, 16, 17, 18, 19, 20, 22—15 days. Cloudy, 11, 24, 25, 26, 27, 28—6 days. No record for the rest of the month.

JULY.—Sunny, 1, 2, 3, 4, 5, 7, 10, 11, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 28, 29, 30—21 days. Cloudy, 8, 9, 12, 22, 26—5 days. No record for the rest of the month.

AUG.—Sunny, 1, 2, 3, 4, 5, 7, 10, 11, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 28, 29, 30—21 days. Cloudy, 8, 9, 12, 22, 26—5 days. No record for the rest of the month.

SEPT.—Sunny, 1, 2, 3, 5, 6, 9, 10, 11, 12, 13, 14, 19, 21, 23, 24, 28, 29—17 days. Cloudy, 16, 18, 26, 27, 30—5 days. No record for the rest of the month.

OCT.—Sunny, 4, 6, 9, 10, 24, 25, 30, 31—8 days. Cloudy, 1, 2, 3, 5, 7, 11, 12, 13, 14, 15, 17, 18, 20, 21, 22, 23, 26, 27—18 days. No record for the rest of the month.

NOV.—Sunny, 3, 4, 11, 12, 13, 14, 16, 17, 20, 21, 23—11 days. Cloudy, 2, 6, 8, 9, 10, 18, 19, 25, 26, 27, 28, 29, 30—13 days. No record for the rest of the month.

DEC.—Sunny, 1, 7, 10, 11, 13, 14, 21, 22, 23, 28, 29—11 days. Cloudy, 2, 3, 4, 5, 6, 8, 9, 12, 15, 16, 17, 18, 19, 20, 24, 25, 26, 31—18 days.

## MANISTEE.

AUG.—Sunny, 1, 4, 5, 8, 9, 12, 13, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31—22 days. Cloudy, 2, 3, 6, 7, 10, 11, 14, 15, 16—9 days.

SEPT.—Sunny, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 20, 21, 22, 23, 24—18 days. Cloudy, 12, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 30—12 days.

OCT.—Sunny, 4, 6, 8, 9, 10, 14, 25, 29, 30—9 days. Cloudy, 1, 2, 3, 5, 7, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 31—22 days.

NOV.—Sunny, 6, 7, 11, 12, 13, 17, 20, 23, 26, 27—10 days. Cloudy, 1, 2, 3, 4, 5, 8, 9, 10, 14, 15, 16, 18, 19, 21, 22, 24, 25, 28, 29, 30—20 days.

DEC.—Sunny, 1, 9, 20, 22—4 days. Cloudy, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31—27 days.

## GRAND HAVEN.

JAN.—No record made on register.

FEB.—Clear, 11, 16. Fair, 10, 15, 17, 18, 19, 21, 22, 23, 24—9 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 14, 20, 25, 26, 27, 28, 29—18 days.

MARCH.—Sunny, 3, 5, 7, 8, 12, 13, 16, 17, 24, 31—10 days. Cloudy, 1, 2, 4, 6, 9, 10, 11, 14, 15, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30—21 days.

APRIL.—Sunny, 2, 3, 4, 6, 7, 11, 12, 14, 16, 18, 20, 23, 24, 25, 27, 28—16 days. Cloudy, 1, 5, 8, 9, 10, 13, 15, 17, 19, 21, 22, 26, 29, 30—14 days.

MAY.—Sunny, 16, 19, 20, 21, 22, 31—6 days. Cloudy, 2, 3, 4, 7, 8, 9, 10, 11, 13, 14, 17, 18, 23, 27, 30—15 days. No record for the rest of the month.

JUNE.—Sunny, 1, 2, 3, 4, 6, 8, 11, 13, 15, 16, 17, 18, 19, 20, 22, 24, 25, 28, 29, 30—20 days. Cloudy, 5, 7, 9, 10, 12, 14, 21, 23, 26, 27—10 days.

JULY.—Sunny, 2, 3, 4, 5, 7, 10, 11, 15, 16, 18, 19, 20, 23, 24, 25, 28—16 days. Cloudy, 1, 6, 8, 9, 12, 13, 14, 17, 21, 22, 26, 27, 29, 30, 31—15 days.

AUG.—Sunny, 1, 9, 13, 18, 22, 23, 24, 25, 27, 28, 30—11 days. Cloudy, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 14, 15, 16, 17, 19, 20, 21, 26, 29, 31—20 days.

SEPT.—Sunny, 1, 2, 3, 4, 5, 6, 8, 9, 13, 14, 22, 24, 29—13 days. Cloudy, 7, 10, 11, 12, 15, 16, 17, 18, 19, 20, 21, 23, 25, 26, 27, 28, 30—17 days.

OCT.—Sunny, 1, 4, 6, 7, 8, 9, 10, 14, 25, 29, 30—11 days. Cloudy, 2, 3, 5, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 31—20 days.

Nov.—Sunny, 3, 11, 12, 13, 19, 20, 21, 22, 23, 24, 26—11 days. Cloudy, 1, 2, 4, 5, 6, 7, 8, 9, 10, 14, 15, 16, 17, 18, 25, 27, 28, 29, 30—19 days.

DEC.—Sunny, 4, 9, 14, 21, 22—5 days. Cloudy, 1, 2, 3, 5, 6, 7, 8, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 23, 24, 25, 26, 27, 28, 29, 30, 31—26 days.

## PORT HURON.

FEB.—Sunny, 9, 11, 15, 16—4 days. Fair, 5, 6, 8, 12, 13, 17, 18, 21, 22, 23, 24, 25, 27, 28, 29—15 days. Cloudy, 1, 2, 3, 4, 7, 10, 14, 19, 20, 25—10 days.

MARCH.—Sunny, 7, 8, 17, 18, 31—5 days. Cloudy, 1, 2, 4, 5, 6, 10, 13, 16, 20, 21, 26, 27, 28, 30—14 days. No record for the rest of the month.

APRIL.—Sunny, 3, 6, 7, 8, 12, 16, 22, 25, 27, 28—10 days. Cloudy, 5, 10, 15, 17, 30—5 days. No record for the rest of the month.

MAY.—Fair, 1, 2, 3, 5, 9, 12, 15, 17, 19, 21, 23, 24, 26, 29, 30, 31—16 days. Clear, 6, 10, 11, 20, 22—5 days. Cloudy, 4, 7, 8, 13, 14, 16, 18, 25, 27, 28—10 days.

JUNE.—Clear, 2, 3, 4, 5, 8, 15, 16, 17, 18, 19, 30—11 days. Fair, 1, 6, 7, 9, 11, 12, 13, 14, 20, 21, 22, 23, 24, 25, 26, 29—16 days. Cloudy, 10, 27, 28.

AUG.—Clear, 1, 5, 9, 13, 14, 18, 19, 22, 24, 25, 27, 28, 30—13 days. Fair, 8, 16, 17, 21, 23, 26, 29—7 days. Cloudy, 2, 3, 4, 6, 7, 10, 11, 12, 15, 21, 31—11 days.

SEPT.—Clear, 1, 2, 3, 5, 6, 11, 12, 13, 14, 20, 23, 24, 28, 29—14 days. Fair, 4, 8, 9, 10, 17, 19, 21, 22, 25—9 days. Cloudy, 7, 15, 16, 18, 26, 27, 30—7 days.

OCT.—Clear, 9, 10, 24, 25, 28, 30, 31—7 days. Fair, 6, 14, 16, 17, 27, 29—6 days. Cloudy, 1, 2, 3, 4, 5, 7, 8, 11, 12, 13, 15, 18, 19, 20, 21, 22, 23, 26—18 days.

NOV.—Clear, 3, 11, 13, 16, 17, 23, 24, 25—8 days. Fair, 4, 5, 7, 12, 14, 21—6 days. Cloudy, 1, 2, 6, 8, 9, 10, 15, 18, 19, 20, 22, 26, 27, 28, 29, 30—16 days.

DEC.—Clear, 1, 13, 14, 23—4 days. Fair, 7, 10, 22, 28, 29—5 days. Cloudy, 2, 3, 4, 5, 6, 8, 9, 11, 12, 15, 16, 17, 18, 19, 20, 21, 24, 25, 26, 27, 30, 31—23 days.

## LANSING.

JAN.—Sunny, 8, 11, 15, 16—4 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 9, 10, 12, 13, 14, 17, 18, 19, 20, 21—17 days. No record for the rest of the month.

JUNE.—Sunny, 4, 5, 6, 7, 8, 11, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 26, 29, 30—20 days. Cloudy, 9, 10, 12, 18, 25, 27, 28—7 days. No record for the rest of the month.

JULY.—Sunny, 1, 2, 3, 5, 7, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 30, 31—25 days. Cloudy, 4, 6, 8, 9, 12, 26—6 days.

AUG.—Sunny, 1, 3, 4, 5, 8, 13, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30—17 days. Cloudy, 2, 6, 7, 9, 10, 11, 12, 14, 15, 16, 17, 19, 29, 31—14 days.

SEPT.—Sunny, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 22, 24—16 days. Cloudy, 15, 16, 17, 18, 25, 26, 27, 28, 30—9 days. No record for the rest of the month.

OCT.—Sunny, 6, 9, 10, 25—4 days. Cloudy, 1, 2, 3, 5, 7, 11, 12, 13, 14, 15, 17, 18, 21, 22, 23, 26—16 days. Fair, 4. No record for the rest of the month.

NOV.—Sunny, 3, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 25—14 days. Cloudy, 1, 2, 4, 5, 8, 9, 10, 18, 26, 27, 28, 29, 30—13 days. No record for the rest of the month.

DEC.—Sunny, 11, 13, 14, 19, 21, 22, 23—7 days. Cloudy, 1, 2, 3, 5, 8, 12, 15, 16, 17, 18, 20, 24, 25, 26, 27, 31—16 days. No record for the rest of the month.

## ANN ARBOR.

JAN.—Sunny, 21, 22, 27, 28—4 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 23, 24, 25, 26, 29, 30, 31—25 days. No record for Jan. 8 and 11.

FEB.—Sunny, 11, 12, 13, 15, 16, 18, 22, 23, 27—10 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 10, 14, 17, 19, 20, 24, 25, 26, 28, 29—17 days. No record for the rest of the month.

MARCH.—Sunny, 3, 4, 5, 6, 7, 8, 13, 14, 15, 18—10 days. Cloudy, 1, 2, 9, 10, 11, 16, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29—17 days. No record for the rest of the month.

APRIL.—Sunny, 1, 2, 6, 7, 8, 11, 12, 16, 24, 25, 26, 27, 28, 29—14 days. Cloudy, 4, 5, 9, 10, 13, 14, 15, 17, 19, 20, 21, 22, 23, 30—14 days. No record for the rest of the month.

MAY.—Sunny, 2, 3, 5, 6, 19, 20, 21, 22—8 days. Cloudy, 1, 4, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 23, 24, 25, 26, 27, 28, 29, 30, 31—23 days.

JUNE.—Sunny, 2, 3, 4, 5, 6, 7, 8, 11, 16, 17, 19—11 days. Cloudy, 1, 9, 10, 12, 13, 14, 21, 23, 25, 26, 27, 28, 29—13 days. No record for the rest of the month.

JULY.—Sunny, 3, 10, 15, 20, 24—5 days. Cloudy, 4, 8, 9, 12, 13, 14, 16, 17, 18, 19, 22, 23, 26, 27, 28, 31—16 days. No record for the rest of the month.

AUG.—Sunny, 22, 23, 24, 25, 27, 28—6 days. Cloudy, 2, 3, 4, 6, 7, 8, 10, 11, 12, 15, 16, 17, 18, 19, 20, 21, 31—17 days. No record for the rest of the month.

SEPT.—Sunny, 5, 6, 9, 10, 13, 14, 22, 23, 24—9 days. Cloudy, 7, 16, 17, 18, 26, 27, 29, 30—8 days. No record for the rest of the month.

OCT.—Sunny, 9, 10, 30, 31—4 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28—23 days. No record for the rest of the month.

NOV.—Sunny, 3, 4, 12, 13, 20, 23, 25—7 days. Cloudy, 1, 2, 5, 6, 7, 8, 9, 10, 15, 18, 26, 27, 28, 29, 30—15 days. No record for the rest of the month.

DEC.—Sunny, 13, 21, 23. Cloudy, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 24, 25, 26, 27, 30, 31—22 days. No record for the rest of the month.

#### KALAMAZOO.

JAN.—Sunny, 2, 21, 22, 24, 27—5 days. Cloudy, 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 23, 25, 26, 28, 29, 30, 31—26 days.

FEB.—Sunny, 8, 9, 11, 15, 16, 18, 21, 22, 23—9 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 10, 12, 13, 14, 17, 19, 20, 24, 25, 26, 27, 28, 29—20 days.

MARCH.—Sunny, 7, 8, 13, 14, 15, 17, 18, 31—8 days. Cloudy, 1, 2, 3, 4, 5, 6, 9, 10, 11, 12, 16, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30—23 days.

APRIL.—Sunny, 1, 4, 6, 7, 8, 12, 14, 16, 18, 23, 24, 25, 26, 27, 28, 29—16 days. Cloudy, 2, 3, 5, 9, 10, 11, 13, 15, 17, 19, 20, 21, 22, 30—14 days.

MAY.—Sunny, 2, 3, 5, 6, 16, 19, 20, 21, 22, 24, 26, 29, 30—13 days. Cloudy, 1, 4, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 23, 25, 27, 28, 31—18 days.

JUNE.—Sunny, 3, 4, 5, 6, 8, 11, 15, 16, 17, 18, 19, 20, 21, 22, 24, 29, 30—17 days. Cloudy, 1, 2, 7, 9, 10, 12, 13, 14, 23, 25, 26, 27, 28—13 days.

JULY.—Sunny, 1, 2, 3, 5, 7, 10, 11, 13, 15, 16, 19, 20, 23, 24, 25, 27, 28, 29, 30—19 days. Cloudy, 4, 6, 8, 9, 12, 14, 17, 18, 21, 22, 26, 31—12 days.

AUG.—Sunny, 1, 5, 8, 9, 13, 16, 17, 18, 19, 20, 22, 23, 24, 25, 27, 28—16 days. Cloudy, 2, 3, 4, 6, 7, 10, 11, 12, 14, 15, 21, 26, 29, 30, 31—15 days.

SEPT.—Sunny, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 19, 20, 21, 22, 23, 24—19 days. Cloudy, 12, 15, 16, 17, 18, 25, 26, 27, 28, 29, 30—11 days.

OCT.—Sunny, 1, 4, 6, 9, 10, 16, 25, 29, 31—9 days. Cloudy, 2, 3, 5, 7, 8, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 30—22 days.

NOV.—Sunny, 3, 11, 12, 13, 16, 17, 20, 21, 23, 24, 25, 26—12 days. Cloudy, 1, 2, 4, 5, 6, 7, 8, 9, 10, 15, 18, 19, 22, 27, 28, 29, 30—17 days. Fair, 14.

DEC.—Sunny, 10, 13, 21, 22, 28, 29—6 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 14, 15, 16, 17, 18, 19, 20, 23, 24, 25, 26, 27, 30, 31—25 days.

#### DETROIT.

JUNE.—Clear, 3, 4, 8, 10, 16, 19—6 days. Fair, 2, 5, 6, 7, 11, 12, 14, 15, 17, 18, 20, 22, 24, 25, 26, 28, 29, 30—18 days. Cloudy, 1, 9, 13, 21, 23, 27—6 days.

JULY.—Sunny, 1, 2, 3, 10, 11, 15, 16, 20—8 days. Fair, 4, 5, 6, 7, 8, 14, 19, 21, 23, 24, 25—11 days. Cloudy, 9, 12, 13, 17, 18, 22—6 days. No record for the rest of the month.

AUG.—Clear, 9, 13, 14, 18, 22, 23, 24, 25, 26, 27, 28, 30—12 days. Fair, 1, 5, 8, 16, 17, 19, 29—7 days. Cloudy, 2, 3, 4, 6, 7, 10, 11, 12, 15, 20, 21, 31—12 days.

SEPT.—Clear, 2, 3, 6, 9, 10, 12, 13, 14, 20, 21, 22, 24—12 days. Fair, 1, 5, 8, 11, 17, 19, 23, 25, 28—9 days. Cloudy, 4, 7, 15, 16, 18, 26, 27, 29, 30—9 days.

OCT.—Clear, 9, 10, 16, 24, 25, 28, 29, 30, 31—9 days. Fair, 4, 6, 8, 19, 27—5 days. Cloudy, 1, 2, 3, 5, 7, 11, 12, 13, 14, 15, 17, 18, 20, 21, 22, 23, 26—17 days.

NOV.—Clear, 3, 12, 13, 16, 20, 22, 23, 24, 25—9 days. Fair, 1, 11, 14, 19—4 days. Cloudy, 2, 4, 5, 6, 7, 8, 9, 10, 15, 17, 18, 21, 26, 27, 28, 29, 30—17 days.

DEC.—Clear, 1, 13, 14, 21, 22, 23—6 days. Fair, 6, 11, 28, 29—4 days. Cloudy, 2, 3, 4, 5, 7, 8, 9, 10, 12, 15, 16, 17, 18, 19, 20, 24, 25, 26, 27, 30, 31—21 days.

#### GULLIVER LAKE.

JAN.—Hours of sunshine, 119.

FEB.—Clear, 8; fair, 6; cloudy, 15; rainy, 12; hours sunshine, 104.

MARCH.—Clear, 15; fair, 4; cloudy, 12; rainy, 9; hours sunshine, 194.



APRIL.—Clear, 13; fair, 9; cloudy, 8; rainy, 13; hours sunshine, 219½.

MAY.—Clear, 11; fair, 7; cloudy, 13; rainy, 17; hours sunshine, 170.

JUNE.—Clear, 19; fair, 6; cloudy, 5; rainy, 4; hours sunshine, 304.

JULY.—Hours sunshine, 277.

AUG.—Hours sunshine, 293½.

SEPT.—Hours sunshine, 216½.

OCT.—Hours sunshine, 146.

NOV.—Hours sunshine, 120.

DEC.—Clear, 7; fair 4; cloudy, 20; rainy, 10; hours sunshine, 79.

EXHIBIT 21. - *Dates of Solar and Lunar Halos,*

Line Number.	Stations.	Dates of Halos Recorded,									
		January.		February.		March.		April.		May.	
		Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.
1	Marquette.....	-----	-----	-----	-----	-----	-----	9	-----	{ 1,2,10, / 23,30 }	17
2	Gulliver Lake.....	-----	-----	-----	-----	-----	-----	4	-----	1, 30	-----
3	Manistee.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4	Alpena.....	5	24,25,26	13	24, 26	25	25	-----	-----	-----	23, 24
5	Grand Haven.....	-----	24	-----	17, 28	23	24, 29	-----	18,25	-----	-----
6	Port Austin.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
7	Port Huron.....	-----	-----	-----	-----	-----	-----	22	22,26	-----	-----
8	Thornville.....	-----	24	-----	-----	-----	-----	-----	-----	† 6	-----
9	Lansing, S. B. of H.	19,24	-----	6,17,22,28	17,18,22	23,24	23,24,29	{ 1,4,13, / 18,22 }	22,25	19	-----
10	Ann Arbor.....	-----	24	-----	-----	-----	-----	-----	-----	-----	-----
11	Hudson.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
12	Kalamazoo.....	-----	24, 28	† 26, 27	17, 22	-----	24	18, 22	18,25	-----	-----
13	Birmingham.....	-----	24	-----	-----	9	-----	-----	22	-----	-----
14	Detroit.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

† Parhelion.

*Recorded on the Monthly Registers in 1888.*

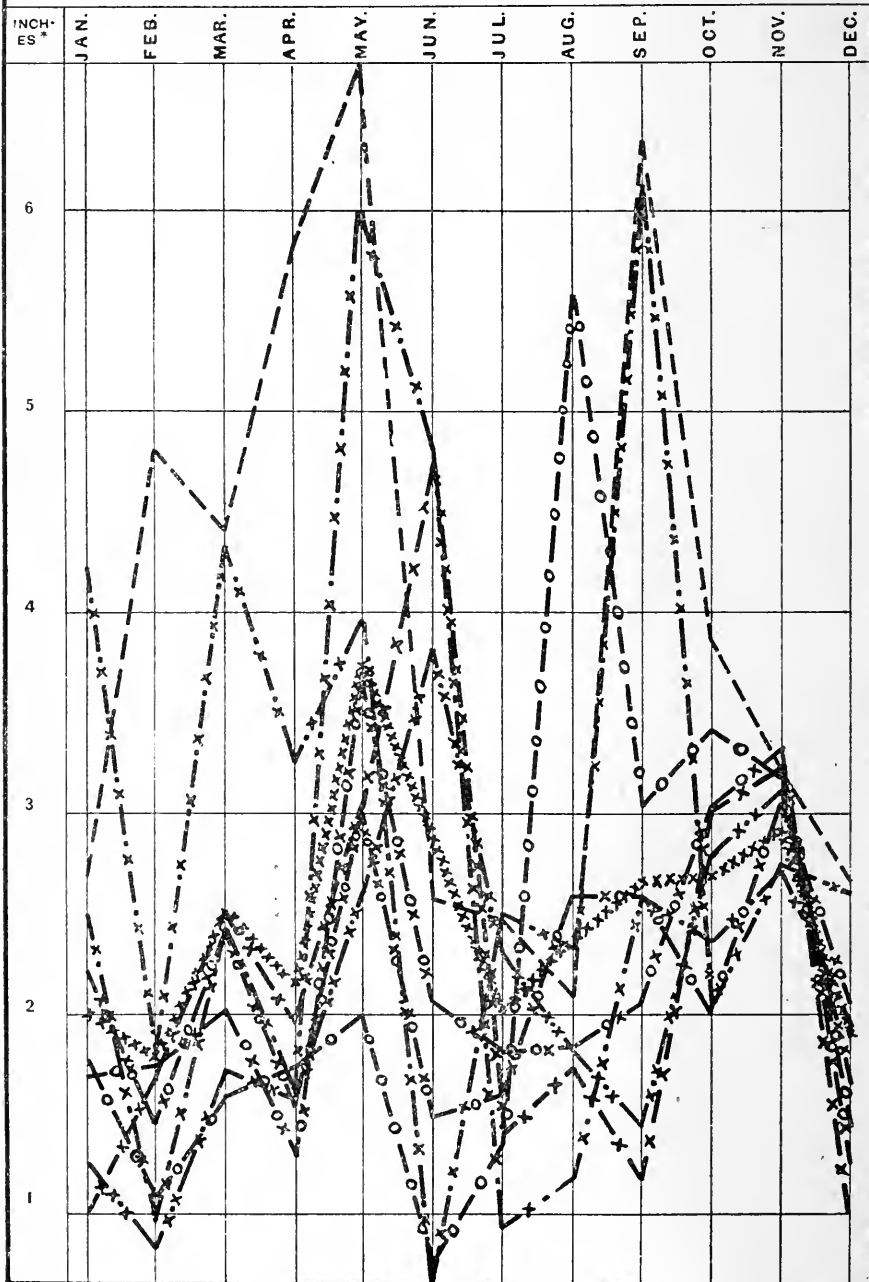
Months, 1888.														Line Number.
June.		July.		August.		September.		October.		November.		December.		
Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	
5		13, 29						10, 11, 21	14		11, 13, 15, 17			1
														2
									16		17		14, 18	3
	* 13, 14			21	19				14		11, 13, 17		9, 18	4
									16	4				5
														6
														7
														8
5, 18	17, 18, 22	13	13	7	13, 20	26			21	4, 17	11, 12, 17		18	9
					20						† 13, 17		15	10
											14			11
				21	20				10		13		18	12
										4				13
											13, 17			14

\* Lunar Corona.

† Also large Lunar Corona Nov. 13, 14.

DIAGRAM VII.—RAINFALL, BY MONTHS IN 1888.

INCHES OF RAIN AND MELTED SNOW.—AT STATIONS IN MICHIGAN:  
 ANN ARBOR —x—x, GULLIVER LAKE ———, GRAND HAVEN —xo—xo,  
 HARRISVILLE —o—o, LANSING —ox—ox, MARSHALL —x—x,  
 THORNVILLE —x—x, TRAVERSE CITY —x—x; AV. FOR 17 STATIONS xxxxxxxx.



\*SCALE, 1 IN. RAINFALL TO 1.05 IN. VERTICALLY.

TABLE VII.—*Inches of Rain and Melted Snow for the Year, and for each Month of the Year 1888, at 18 Stations in Michigan,—as compiled from Daily Observations made by Observers\* for the State Board of Health, and for the U. S. Signal Service.*

Stations In Michigan.* (Those of the U. S. Signal Service in Italics.)	Divisions of the State.†	Inches of Rain and Melted Snow.													
		Year.		Months, 1888.											
		Norm. ‡	1888.	Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 17 stations §	-----	-----	29.55	1.99	1.77	2.51	2.15	3.73	2.87	2.02	2.38	2.66	2.68	2.92	1.89
Marquette.....	U. P.	30.12 <sup>8</sup>	35.45	2.00	1.16	2.80	5.07	3.27	1.54	1.32	4.17	5.40	2.40	2.07	4.25
Gulliver Lake.....	U. P.	39.31 <sup>2</sup>	47.62	2.69	4.81	4.39	5.78	6.74	2.57	2.47	2.08	6.35	3.86	3.21	2.87
Traverse City.....	N. W.	40.26 <sup>7</sup>	36.58	4.22	1.82	4.33	3.26	3.97	0.66	2.50	2.33	6.14	2.03	2.73	2.59
Alpena.....	N. E.	37.33 <sup>16</sup>	29.36	1.84	1.97	2.24	2.82	3.03	3.06	1.56	3.33	2.41	2.90	2.13	2.07
Harrisville.....	N. E.	30.28 <sup>2</sup>	26.95	1.77	1.11	1.58	1.74	2.00	0.74	1.37	5.57	3.04	3.42	3.18	1.43
Grand Haven.....	W.	38.74 <sup>13</sup>	25.96	2.20	1.45	2.40	1.54	3.01	1.48	1.59	2.59	2.58	2.00	3.06	2.06
Port Austin.....	B & E.	----- <sup>14</sup>		-----	-----	-----	-----	-----	3.50	1.14	1.75	-----	1.52	2.52	1.63
Port Huron.....	B. & E.	32.73 <sup>12</sup>	24.33	1.46	1.78	2.24	1.25	2.40	2.45	3.24	0.99	1.89	2.52	2.63	1.48
Thornville.....	B. & E.	33.63 <sup>25</sup>	24.90	1.26	0.83	1.72	1.57	2.60	3.81	2.31	1.81	1.44	2.79	3.11	1.65
Agricultural College.	C.	31.99 <sup>9</sup>	26.50	2.18	1.70	1.88	1.15	3.66	2.51	2.40	1.87	1.89	3.00	3.12	1.20
Lansing, S. B. of H....	C.	35.46	25.76	1.69	1.74	2.02	1.29	3.65	2.07	1.80	1.83	2.06	3.03	3.33	1.25
Ann Arbor.....	S. C.	-----	26.52	1.01	1.66	2.51	1.95	3.03	4.76	1.39	1.73	1.18	3.04	3.26	1.00
Battle Creek.....	S. C.	-----	23.94	2.00	1.62	1.93	1.21	5.27	2.74	1.32	0.23	1.52	2.37	2.60	1.13
Hudson.....	S. C.	----- <sup>12</sup>	25.67	1.44	2.57	1.46	1.44	2.60	3.99	1.90	3.03	0.99	2.18	2.64	1.43
Kalamazoo.....	S. C.	38.00 <sup>8</sup>	28.03	1.89	1.50	2.22	1.07	4.92	4.14	2.37	0.63	2.40	2.46	2.49	1.94
Marshall.....	S. C.	31.63 <sup>4</sup>	29.99	2.51	0.97	2.43	1.60	5.99	4.80	0.93	1.18	2.57	2.37	2.71	1.93
Parkville.....	S. C.	40.10 <sup>2</sup>	31.64	2.43	2.01	2.80	1.90	6.82	2.69	1.87	0.69	2.36	2.13	3.47	2.47
Birmingham.....	S. E.	27.72 <sup>17</sup>	28.09	1.64	1.41	2.92	1.73	3.70	4.10	1.77	1.31	1.19	3.32	3.42	1.58
Detroit.....	S. E.	33.79	29.02	1.58	1.58	2.76	1.44	1.94	3.41	3.48	5.27	1.26	2.09	3.05	1.16

\* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit I, page 2.

† The names of divisions and the counties in each are stated in Exhibit I., in a paper which follows, on weekly reports of sickness.

‡ Numbers in this column state the average annual rainfall for periods of years ending in each case with Dec. 31, 1888. The small figures above and at the right of numbers which state the rainfall, denote the number of years included in the average.

§ This line is an average for only the stations from which statements, nearly complete, are given for every month of the year. It does not include Battle Creek and Port Austin.

|| The total rainfall for 6 months in 1888 is 12.06 inches.

NOTE.—Computations of amount of rainfall were furnished by the observers at Detroit, Alpena, Grand Haven, Port Huron, Ann Arbor, and Marquette for the year. All other computations in Table VII. were made in the office of the Secretary of the State Board of Health.

The lines for 9 representative stations in Table VII. are graphically represented in Diagram VII., page 50.

EXHIBIT 22.—*Inches of Rain and Melted Snow by Years and Months, in 1888, compared with Annual and Monthly Averages for 1887, and for the eleven Years, 1877-87. These Averages are for Groups of Several Stations in Michigan.*

Years, etc.	Inches of Rain and Melted Snow.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 11 years, 1877-87*	36.51	2.17	2.71	2.39	2.56	3.31	4.07	3.51	3.42	3.53	3.54	3.12	2.77
1887 (17 stations)....	29.82	2.57	4.40	1.08	1.69	2.35	2.62	2.51	1.86	3.12	2.69	2.00	2.92
1888 (17 stations)....	29.55	1.99	1.77	2.51	2.15	3.73	2.87	2.02	2.38	2.66	2.68	2.92	1.89
In 1888 <b>Greater</b> than average for 11 years, 1877-87.....	-----	-----	-----	0.12	-----	0.42	-----	-----	-----	-----	-----	-----	-----
In 1888 <b>Less</b> than Av. for 11 years, 1877-87.....	6.96	0.18	0.94	-----	0.41	-----	1.20	1.49	1.04	0.87	0.86	0.20	0.88
In 1888 <b>Greater</b> than in 1887.....	-----	-----	-----	1.43	0.46	1.38	0.25	-----	0.52	-----	-----	0.92	-----
In 1888 <b>Less</b> than in 1887.....	0.27	0.58	2.63	-----	-----	-----	-----	0.49	-----	0.46	0.01	-----	1.93

\* Thornville, Kalamazoo, Detroit for 1877-87; Mendon for 1877-8 and 1880-2; Tecumseh for 1877-8 and 1880-5; Niles for 1878-81; Nirvana, Coldwater, Woodmere Cemetery (near Detroit) for 1877-9; Agricultural College for 1877-8 and 1881-7; Otisville for 1878-80 and 1882; Marquette for 1879-84 and 1886-7; Alpena, Grand Haven, Port Huron for 1879-87; Battle Creek for 1877-8 and 1884; Benton Harbor for 1877-8; Escanaba, Lansing for 1880-7; Washington for 1880-3; Fife Lake, Ypsilanti for 1877; Harrisville for 1881-2 and 1887; Reed City for 1881-5; Winfield for 1881-3; Ann Arbor for 1881-2 and 1885-6; Marshall for 1881-4 and 1886-7; Hudson and Mallory Lake for 1881 and 1886; Traverse City 1882-7; Hastings for 1882; Hillsdale for 1882-4; Parkville for 1882-3 and 1885-7; Ionia for 1883-4; Manistique, Swartz Creek for 1884-5; Mackinaw City for 1884-7; Pentwater, East Saginaw for 1886; Birmingham and Gulliver Lake for 1887.

EXHIBIT 23.—*Comparison of the Rainfall during the Year and during each month of the Year 1888, with that for the Year 1887, and with the Average for the 24 Years, 1864-87. Observations made by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, etc.	Inches of Rain and Melted Snow.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 24 years, 1864-87	32.22	1.85	2.11	2.56	2.41	3.08	4.19	3.38	2.81	3.10	2.58	2.23	1.96
1887.....	31.10	3.25	5.71	1.78	0.90	2.42	2.47	1.50	0.89	4.72	1.86	2.28	3.32
1888.....	26.56	2.18	1.70	1.88	1.15	3.66	2.51	2.40	1.87	1.89	3.00	3.12	1.20
In 1888 <b>Greater</b> than average for 24 years, 1864-87.....	-----	.33	-----	-----	-----	.58	-----	-----	-----	-----	.42	.89	-----
In 1888 <b>Less</b> than Av. for 24 years, 1864-87.....	5.66	-----	.41	.68	1.26	-----	1.68	.98	.94	1.21	-----	-----	.76
In 1888 <b>Greater</b> than in 1887.....	-----	-----	-----	.10	.25	1.24	.04	.90	.98	-----	1.14	.84	-----
In 1888 <b>Less</b> than in 1887.....	4.54	1.07	4.01	-----	-----	-----	-----	-----	-----	2.83	-----	-----	2.12

**EXHIBIT 24.**—Average Amount of Atmospheric Ozone (Day) by Year and Months, in 1888, compared with Annual and Monthly Averages for 1887, and for the 11 years, 1877-87. These Averages are for Groups of Several Stations in Michigan.

Years, etc.	Ozone by Day.—Degree of Coloration of Test-paper.†												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 11 years, 1877-87*	3.11	3.34	3.47	3.48	3.26	3.13	2.94	2.74	2.93	2.81	2.87	3.06	3.23
1887 (11 stations)....	3.29	3.28	3.38	3.63	3.43	3.29	3.10	2.94	3.13	3.22	3.38	3.24	3.48
1888 (9 stations).....	4.20	3.52	3.65	4.03	4.75	5.57	5.06	3.15	3.77	4.40	4.33	3.61	4.57
In 1888 <b>Greater</b> than Av. for 11 years, 1877-87..... In 1888 <b>Less</b> than Av. for 11 years, 1877-87.....	1.09	0.18	0.18	0.55	1.49	2.44	2.12	0.41	0.84	1.59	1.46	0.55	1.34
In 1888 <b>Greater</b> than in 1887..... In 1888 <b>Less</b> than in 1887.....	0.91	0.24	0.27	0.40	1.32	2.28	1.96	0.21	0.64	1.18	0.95	0.37	1.09

\* Thornville, Kalamazoo for 1877-87; Mendon for 1877-83; Tecumseh for 1877-85; Battle Creek for 1877-80 and 1882-4; Niles for 1878-81; Nirvana for 1877-9; Coldwater, Agricultural College for 1877-8 and 1880; Otisville for 1878-80 and 1882; Alpena, Lansing for 1879-83; Washington for 1879-83; Petoskey and Woodmere Cemetery (near Detroit) for 1878-9; Marquette for 1880-1, 1883-4 and 1886-7; Grand Haven for 1880-4; Ann Arbor for 1880-87; Fife Lake, Ypsilanti for 1877; Ionia for 1880 and 1883-4; Adrian for 1880; Hudson and Mallory Lake for 1881; Escanaba for 1881-5 and 1887; Harrisville for 1881-2 and 1885-7; Reed City, Port Huron for 1881-5; Marshall for 1881-7; Traverse City for 1882-7; Hastings and Parkville for 1882; Hillsdale for 1882-4; Port Austin for 1883-5; Winfield for 1883; Manistique, Mackinaw City, Swartz Creek for 1884-5; Pentwater for 1886; Birmingham for 1887.

† In this exhibit allowance has been made for difference in sensitiveness in test-paper.

**EXHIBIT 25.**—Average Amount of Atmospheric Ozone (Night) by Year and Months in 1888, compared with Annual and Monthly Averages for 1887, and for the 11 Years, 1877-1887. These Averages are for Groups of Several Stations in Michigan.\*

Years, etc.	Ozone by Night.—Degree of Coloration of Test-paper.†												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 11 years, 1877-87.....	3.24	3.90	4.05	4.02	3.55	3.30	2.99	2.57	2.53	2.59	3.02	3.33	3.55
1887 (11 stations)....	3.35	3.74	4.14	3.46	3.48	3.27	3.15	2.85	2.95	3.09	3.32	3.24	3.55
1888 (9 stations).....	4.29	3.85	3.97	4.27	4.98	5.53	5.09	3.04	3.73	4.07	4.31	3.61	5.05
In 1888 <b>Greater</b> than Av. for 11 years, 1877-87.....	1.05	.....	.....	0.25	1.43	2.23	2.10	0.47	1.20	1.48	1.29	0.28	1.50
In 1888 <b>Less</b> than Av. for 11 years, 1877-87.....	.....	0.05	0.08	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
In 1888 <b>Greater</b> than in 1887.....	0.94	0.11	.....	0.81	1.50	2.26	1.94	0.19	0.78	0.98	0.99	0.37	1.59
In 1888 <b>Less</b> than in 1887.....	.....	.....	0.17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

\* The stations represented in Exhibit 25 are the same as those represented in Exhibit 24, relative to day ozone, and named in foot-note of that exhibit.

† In this Exhibit allowance has been made for difference in sensitiveness of test-paper.

## OBSERVATIONS FOR OZONE AT LANSING.

Since July 1, 1884, the observations for ozone at Lansing have been taken at the new shelter for meteorological instruments in the southwest part of the Capitol yard. Previous to July 1, 1884, the observations had been taken at the office window. Exhibit E, page 60, of the report for 1885, shows that the average for the month of July, 1884, is greater at each observation—7 A. M. to 2 P. M., 2 P. M. to 9 P. M., and 9 P. M. to 7 A. M. at the shelter for instruments than at the office window. Possibly this fact should be taken into consideration in studying ozone at Lansing through a long period of years.

TABLE VIII.—*Relative Amount of Ozone in the Atmosphere, by Day, during the Year and during each Month of the Year 1888, at 12 Stations, also Average lines for 9 Stations and for 3 Stations in Michigan,—as indicated by Averages of Observations made Daily by exposing Test-paper prepared according to Schönbein's formula, from 7 A. M. to 2 P. M.—Recorded according to a scale of 10 Degrees of Coloration of the Test-paper (greatest coloration by ozone equals 10) by observers for the State Board of Health, and for the U. S. Signal Service.\**

Stations in Michigan.†  (Those of U. S. Signal Service in Italics.)	Divisions of the State.†	Degrees of Coloration of Test-paper—Day Observations.**													
		Year.		Months, 1888.											
		Norm. ‡	1888	Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 9 Stations§			4.20	3.52	3.65	4.03	4.75	5.57	5.06	3.15	3.77	4.40	4.33	3.61	4.57
Av. for 3 Stations			4.21	3.40	3.35	4.37	4.71	5.68	4.95	3.27	3.77	4.95	4.27	3.32	4.43
Marquette	U. P.	7	4.51	6.06	5.03	.....	6.74	6.12	4.61	4.83	6.64	5.52	.....	4.76	
Traverse City	N. W.	10	3.41	6.71	5.35	6.06	6.64	7.52	8.29	8.44	5.96	6.73	6.80	6.45	5.93
Alpena	N. E.	4	3.50	4.76	3.99	4.16	5.35	5.29	6.55	5.39	3.96	3.99	5.24	4.71	3.66
Harrisville	N. E.	4	4.39	4.36	4.19	4.28	3.93	4.78	5.42	4.89	3.09	3.80	4.77	4.61	3.76
Grand Haven	W.	12	4.53	3.69	3.29	5.49	4.99	6.95	5.42	3.41	4.05	4.87	4.27	3.37	4.55
Port Austin	B. & E.	12	4.19	3.34	3.52	3.64	3.66	5.59	4.38	2.6	3.57	4.60	5.00	4.64	5.47
Port Huron	B. & E.	12	3.33	2.51	2.61	2.28	3.86	3.55	4.05	2.45	3.28	4.74	3.84	2.93	3.89
Thornville	B. & E.	10	2.72	3.49	3.64	3.37	3.06	3.99	4.42	3.95	1.67	2.54	3.40	3.39	3.66
Lansing, S. B. of H.	C.	9	3.25	3.45	3.38	3.61	4.06	3.89	3.81	3.82	3.22	3.12	3.11	3.11	2.46
Ann Arbor	S. C.	9	2.84	4.02	3.12	2.69	4.03	5.19	5.94	4.92	2.96	3.57	4.46	4.10	3.26
Battle Creek	S. C.	12	3.00	1.93	1.81	1.54	3.92	4.68	4.09	2.38	2.83	3.54	3.35	2.40	3.47
Kalamazoo	S. C.	6	2.66	3.28	2.67	2.78	3.35	4.16	4.78	3.95	2.06	2.67	3.37	3.16	2.73
Marshall	S. C.	2	3.55	3.84	3.09	3.33	4.03	4.06	5.45	5.29	3.64	3.96	4.40	3.93	1.83
Birmingham	S. E.	2	3.74	4.47	2.90	3.19	3.51	5.22	6.36	5.89	3.13	3.96	4.67	5.26	4.20

\* At the Stations of the U. S. Signal Service for the first six months in 1888 the observations were made by exposing the test-paper from 7 A. M. to 3 P. M., 75th Meridian time; and for the last six months from 8 A. M. to 8 P. M., 75th Meridian time. The corresponding local time for each of these stations is stated in the (\*) foot note to Table I., page 19.

† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit I., page 2. The full names of the divisions and the counties in each division are stated in Exhibit I., in a paper which follows, on weekly reports of sickness.

‡ Numbers in this column state the average annual relative amount of ozone by day for periods of years ending in each case with Dec. 31, 1888. The small figures above and at the right of numbers which state the average denote the number of years included in the average.

§ This line is an average for only the stations from which statements, nearly complete, were received for every month in the year. It does not include Port Huron, Grand Haven, Battle Creek, Marquette and Alpena.

|| This is an average line for Alpena, Grand Haven and Port Huron.

\* The average for 10 months in 1888 is 5.48.

\*\* Allowance has been made for difference in sensitiveness of test-paper in this table.

a, b, c. In the columns from January to December inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

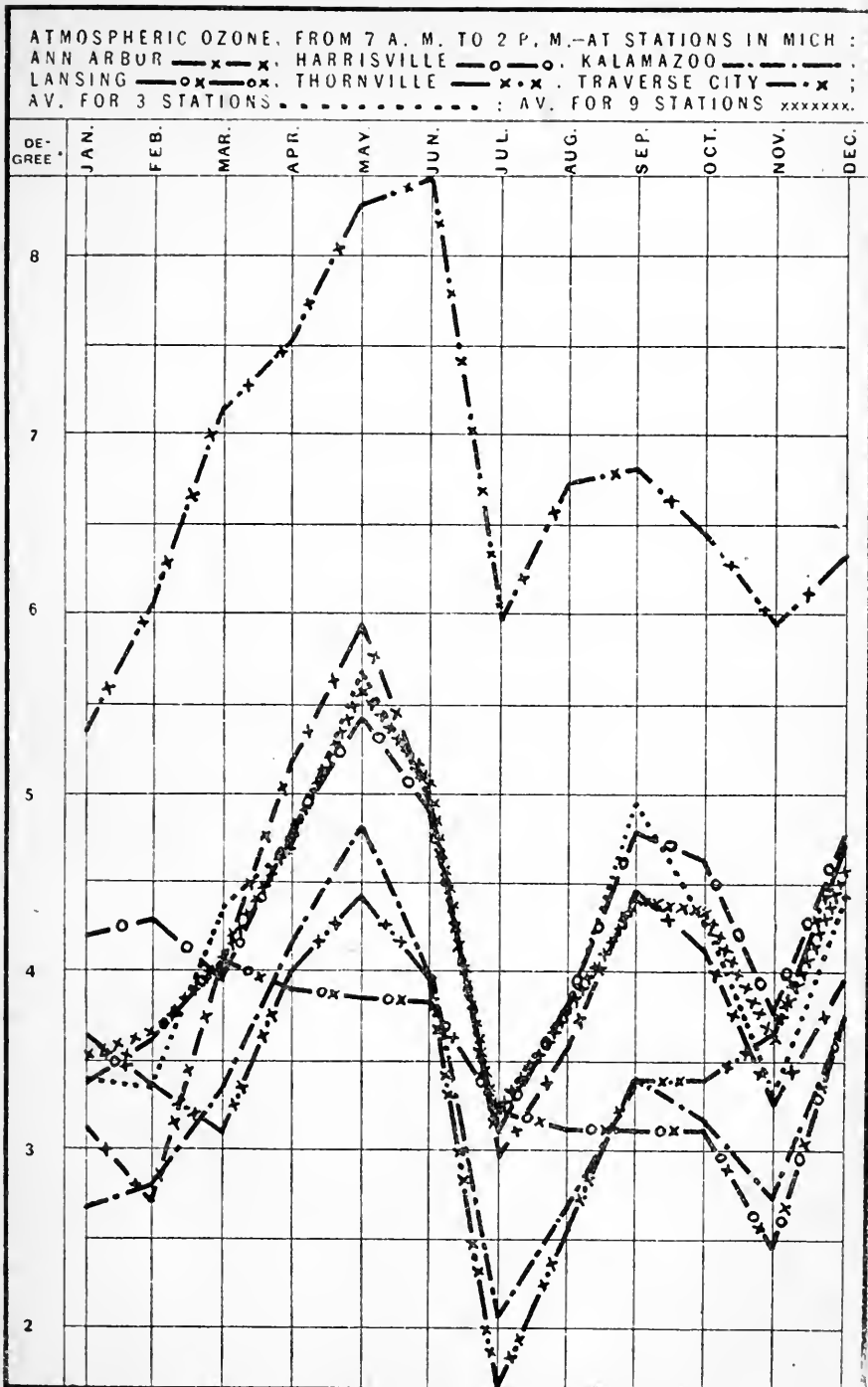
a For 30 days. b For 29 days. c For 28 days. d For 26 days. e For 23 days. f For 21 days.

NOTE.—The computations were furnished by the observers at Ann Arbor for the year; at Grand Haven, Jan. to Oct., and Dec.; at Alpena for May; at Port Huron for May and June. All other computations for Table VIII. were made in the office of the State Board of Health.

Eight lines in this table are graphically represented in Diagram VIII., page 55.



DIAGRAM VIII.—OZONE, AV. BY DAY, MONTHS IN 1888



\*SCALE. 1 DEG. OF COLORATION (ON SCALE OF 10 DEGS.) TO .94 IN. VERTICALLY

TABLE IX.—*Relative amount of Ozone in the Atmosphere at Night, during the Year and during each Month of the Year 1888, at 12 Stations, also Average lines for 9 Stations and for 3 Stations, in Michigan,—as indicated by Averages of Observations made Nightly by Exposing Test-paper, prepared according to Schönbein's formula, from 9 P. M. to 7 A. M.,—Recorded according to a Scale of 10 Degrees of Coloration of the Test-paper (greatest coloration by Ozone equals 10), by Observers for the State Board of Health, and for the U. S. Signal Service.\**

Stations in Michigan. † (Those of the U. S. Signal Service in Italics.)	Divisions of the State.‡	Degrees of Coloration of Test-paper—Night Observations.**													
		Year.	Months, 1888..												
			Norm. §	1888.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.
Av. for 9 Stations			4.29	3.85	3.97	4.27	4.98	5.53	5.09	3.04	3.73	4.07	4.31	3.61	5.05
Av. for 3 Stations¶			4.64	3.67	4.26	4.41	5.10	5.52	5.94	4.31	4.30	5.12	4.63	3.68	4.78
Marquette.....	U. P.	7	††	3.58	4.55	2.74 a	-----	5.45	4.37 f	3.76	4.13 a	4.72	4.33	....	5.93
Traverse City.....	N. W.	3.49 10	6.68	6.41	6.24	6.23	7.89	8.06	8.04	5.60	6.26	6.08	6.07	6.22	7.09
Alpena.....	N. E.	4.25 4	6.18	5.61	6.55	6.70	6.96	7.49	6.50	5.63	5.64	7.18	5.46	4.59	5.80
Harrisville.....	N. E.	5.17	4.71	4.87	4.69	4.32	4.73	5.45	5.17	3.44	4.03	5.05	4.94	4.19	5.60 b
Grand Haven.....	W.	-----	4.47	2.93 b	3.13	4.03	4.46	5.89	6.87	4.57 a	3.99	4.75 a	4.65 c	3.75 e	4.65 b
Port Austin.....	B. & E.	-----	4.84	4.27	5.14	4.70	5.03	5.78	4.84	3.20	4.42	4.53	5.28	5.00	5.91 e
Port Huron.....	B. & E.	12	3.28	2.48	3.10	2.51	3.89	3.19	4.44	2.73	3.26	3.42	3.78	2.69	3.90
Thornville.....	B. & E.	3.29 10	3.92	3.99	3.72	3.90	4.63	5.13	4.57	2.15	3.13	3.55	4.17	2.88	5.22
Lansing, S. B. of H....	C.	3.64 9	3.16	2.03 a	3.38	3.86	3.92 b	4.00	3.43	2.77	2.45	2.49	3.44	2.06	4.03
Ann Arbor.....	S. C.	2.83	3.79	3.23	3.10	4.19	5.21	5.35	4.67	2.27	3.13	3.58	3.48	3.22	3.99 a
Battle Creek.....	S. C.	12	3.19	2.03	1.65	1.71	4.53	4.77	4.39	2.31	3.13	3.80	3.71	2.46	3.82
Kalamazoo.....	S. C.	3.01 6	3.44	3.03	3.65	3.96	4.19	4.74	4.14	1.54	2.39	2.78	3.07	3.02	4.80
Marshall.....	S. E.	3.15 2	3.82	3.96	2.86	4.16	4.26	5.32	5.04	3.22	3.71	3.98	3.26	2.12	3.96
Birmingham.....	S. E.	3.63	4.27	2.83	2.96	3.12	4.99	5.96	5.87	3.18	4.03	4.58	5.04	3.76	4.86

\* At the U. S. Signal Service Stations for the first six months of the year 1888, the observations were made by exposing the test-paper from 10 P. M. to 7 A. M. 75th Meridian time; and for the last six months from 8 P. M. to 8 A. M., 75th Meridian time. The corresponding local time for each of these stations is stated in star (\*) foot-note to Table I., page 19.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit I., page 2.

‡ The full names of the divisions and the counties in each division are stated in Exhibit I., in a paper which follows on weekly reports of sickness.

§ Numbers in this column state the average annual relative amount of ozone by night for periods of years ending in each case with Dec. 31, 1888. The small figures above and at the right of numbers which state the average, denote the number of years included in the average.

|| This line is an average for only the stations from which statements, nearly complete, were received for every month in the year. It does not include Port Huron, Grand Haven, Battle Creek, Marquette and Alpena.

¶ This is an average line for Alpena, Grand Haven and Port Huron.

\*\* Allowance has been made for difference in sensitiveness of test-paper in this table.

†† The average for 10 months is 4.36.

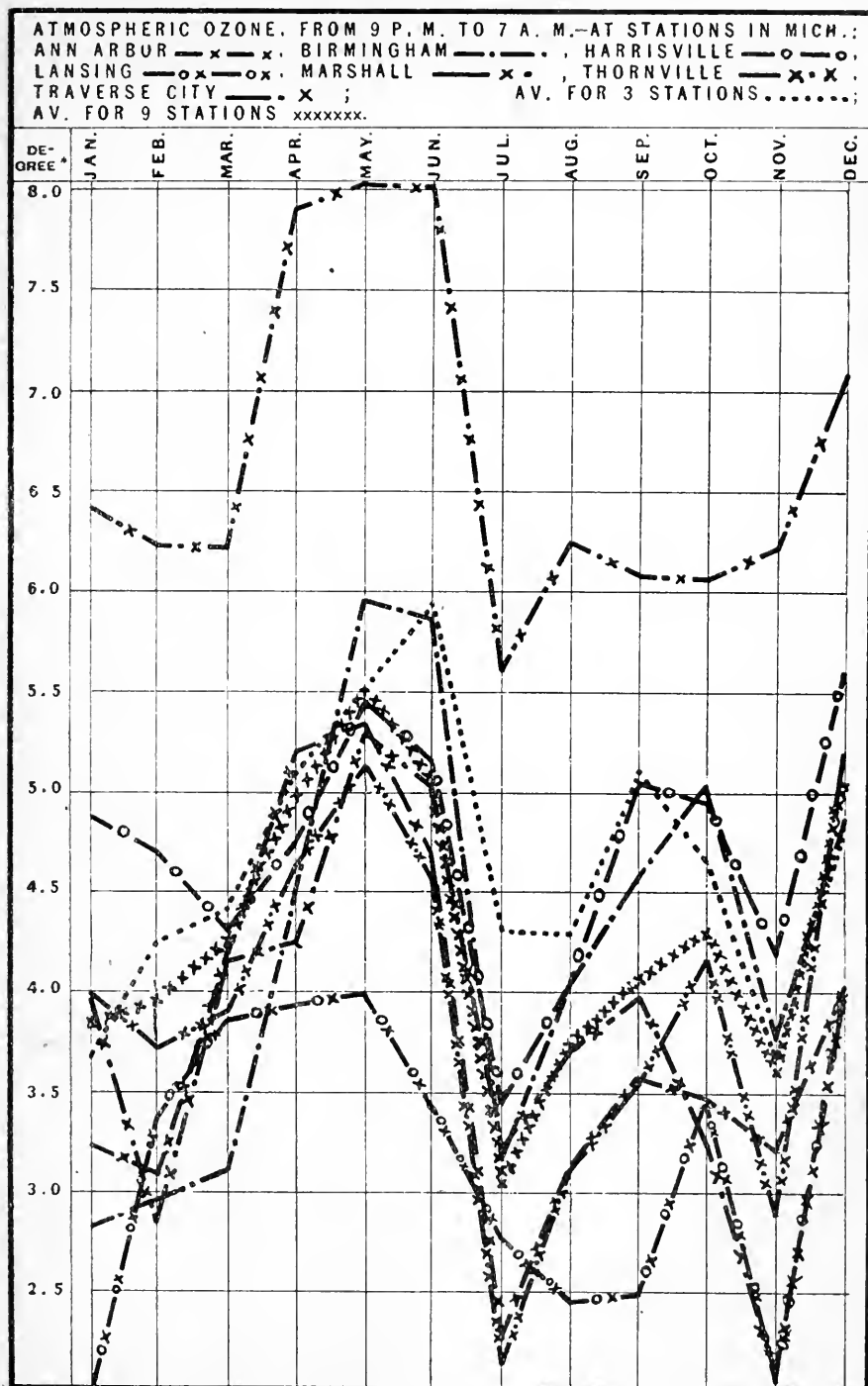
a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 24 days. f For 21 days.

NOTE.—The computations were furnished by the observers at Ann Arbor for the year; at Grand Haven, Feb. to Oct., and Dec.; at Alpena and Port Huron for May. All other computations in Table IX. were made at the office of the State Board of Health.

Seven lines in this table are graphically represented in Diagram IX., page 57.

DIAGRAM IX.—OZONE, AV. BY NIGHT, MONTHS IN 1888.



\* SCALE, 1 DEG. OF COLORATION (ON SCALE OF 10 DEGS.) TO 1.06 IN. VERTICALLY.

TABLE X.—Average velocity of the Wind in Miles per Hour, for each Hour of the Day, by Months of the Year 1888. Compiled from Registers of the Robinson's Self-Registering Anemometer, exposed above the roof of the Capitol, and registering in the office of the State Board of Health, Lansing, Michigan.

Months.	Average.		Hours (1888) and Average Miles per Hour.																													
	Av. 8 years, 1880-87.	1887. 1888.	A. M.												P. M.												A. M.					
			7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7						
Year .....	9.9	9.8	8.4	9.6	10.5	11.5	11.7	12.2	12.1	12.4	12.3	11.8	10.8	9.8	9.2	9.5	9.3	9.0	8.4	8.2	7.8	7.9	7.9	8.0	8.3							
January .....	11.5	12.6	8.7	10.0	10.7	10.5	10.9	11.1	10.9	10.7	10.7	9.7	8.7	9.0	8.6	9.1	8.3	8.2	7.9	7.3	7.6	7.6	8.5	8.5	9.1	9.0						
February .....	11.7	12.6	7.2	8.5	9.0	10.5	11.3	12.0	10.9	11.1	11.4	11.2	10.2	9.8	9.9	11.6	11.3	10.5	10.7	10.1	8.9	8.8	8.6	8.6	8.9	8.8						
March .....	11.2	9.7	9.4	10.9	11.9	12.6	13.0	14.3	14.0	15.7	15.8	15.3	14.5	13.4	12.8	12.4	11.2	10.7	9.3	9.1	8.4	8.9	8.9	9.7	9.3	9.8						
April .....	11.4	12.2	9.4	11.4	12.4	13.6	13.6	13.3	13.5	14.0	13.8	14.0	12.1	9.9	9.2	9.9	10.4	9.9	8.6	8.9	8.3	8.2	8.4	8.3	7.8	7.9						
May .....	9.6	7.4	8.6	9.9	11.2	11.8	11.3	11.5	11.1	12.1	11.9	11.5	10.7	9.0	7.3	7.8	7.7	6.7	6.8	6.9	6.4	6.7	7.3	7.8	8.4	8.2						
June .....	8.5	7.5	8.9	8.4	9.4	10.1	10.7	10.9	11.5	11.3	11.4	10.8	10.7	9.9	8.8	7.4	7.5	8.3	7.9	8.0	8.2	7.2	7.0	6.7	6.6	6.7	8.1					
July .....	8.3	7.8	7.6	7.0	7.6	8.5	9.9	10.3	10.2	10.2	10.0	11.0	10.8	9.6	7.6	6.9	6.4	6.8	6.4	5.6	5.3	5.1	5.5	5.7	5.7	5.3	5.6					
August .....	7.3	6.0	† 8.5	7.0	8.8	9.6	10.5	10.9	11.8	11.3	12.4	12.1	12.3	11.5	9.6	7.9	7.4	6.7	6.9	6.9	6.0	5.6	5.5	5.3	5.7	6.0	6.0					
September .....	8.5	7.7	† 9.2	7.9	8.8	9.6	11.3	12.0	12.8	12.9	12.9	13.1	12.6	11.4	8.8	8.2	8.2	8.0	7.5	7.3	7.2	6.9	6.7	6.7	6.9	7.0						
October .....	8.7	10.8	10.2	8.8	9.8	12.0	13.0	13.3	13.2	13.8	13.3	12.7	11.3	10.3	9.9	9.8	9.9	9.9	9.5	8.4	8.0	8.0	8.1	7.3	7.4	8.3						
November .....	11.3	12.5	*10.1	7.7	8.9	10.4	11.1	10.9	11.9	12.1	12.6	11.7	10.5	9.6	9.8	10.4	10.9	10.9	10.4	9.7	9.0	9.2	8.9	9.0	8.9	9.4	9.1					
December .....	11.0	10.7	*11.9	10.4	10.8	11.0	11.9	12.5	13.0	12.9	12.9	12.6	11.6	11.0	11.6	11.7	12.5	12.4	12.8	11.8	11.5	11.7	11.8	11.5	11.3	11.8						

\* For only about 23 days.

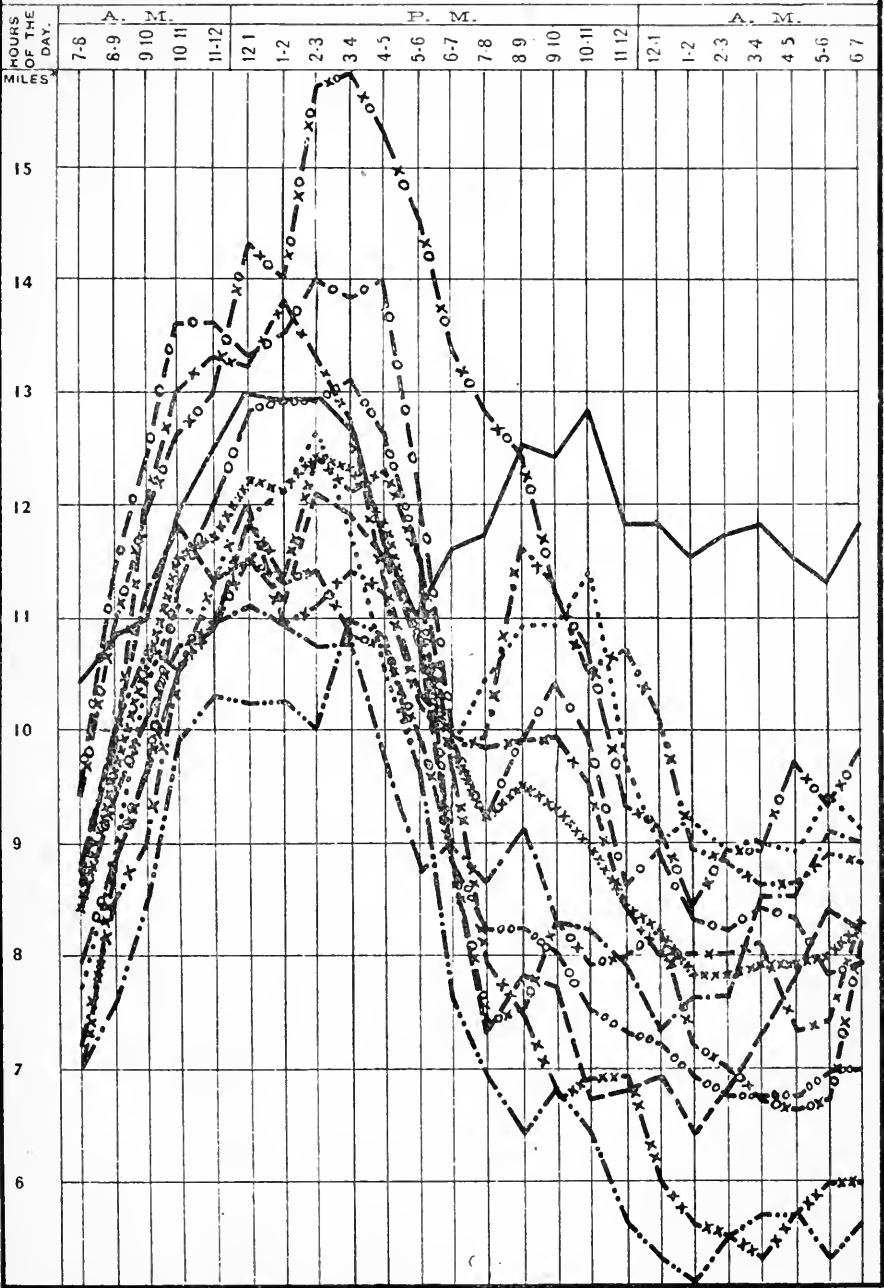
† For only about 30 days.

‡ For only about 25 days.

The statements in the third figure column in Table X. of the average velocity of the wind in miles per hour, by months, during the year 1888, are graphically represented in Diagram XI., page 61. The remaining columns of Table X. for 1888 are graphically represented in Diagram X., page 59.

DIAGRAM X.—VELOCITY OF WIND, BY HOURS AND MONTHS. 1888.

AV. MILES PER HOUR, FOR EACH HOUR OF THE DAY, AT STATE CAPITOL, LANSING, MICH.: JAN. ———, FEB. ———x, MAR. ———xo, APR. ———o—o, MAY ———, JUN. ———ox, JUL. ———, AUG. ———xx, SEPT. ———o—o, OCT. ———x, NOV. ———, DEC. ———; AV. FOR 12 MONTHS xxxxxxxx



\*SCALE ONE MILE PER HOUR TO .59 IN. VERTICALLY.

**EXHIBIT 26.**—Average Velocity of the Wind in Miles per hour by Year and Months in 1888, Compared with Annual and Monthly Averages for 1887, and for the 6 years 1882-87. From Registers of the Robinson's Self-Registering Anemometer.\* These Averages are for Groups of Several Stations in Michigan.

Years, etc.	Average Miles Per Hour.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 6 years, 1882-87.	9.5	11.2	10.5	10.2	10.2	9.2	7.9	7.9	7.5	8.5	9.5	10.8	10.8
1887 (9 stations).....	9.6	11.6	11.1	9.9	10.7	7.4	6.9	7.8	7.0	8.4	11.5	11.6	11.0
1888 (7 stations).....	9.8	10.2	10.1	11.4	10.6	9.1	8.6	7.3	8.6	8.8	10.1	10.2	12.0
In 1888 <b>Greater</b> than average for 6 years, 1882-87.....	0.3	-----	-----	1.2	0.4	-----	0.7	-----	1.1	0.3	0.6	-----	1.2
In 1888 <b>Less</b> than average for 6 years, 1882-87.....	-----	1.0	0.4	-----	-----	0.1	-----	0.6	-----	-----	0.6	-----	-----
In 1888 <b>Greater</b> than in 1887.....	0.2	-----	-----	1.5	-----	1.7	1.7	-----	1.6	0.4	-----	-----	1.0
In 1888 <b>Less</b> than in 1887.....	-----	1.4	1.0	-----	0.1	-----	-----	0.5	-----	-----	1.4	1.4	-----

\* Gibbon's Anemometer was used at Ann Arbor.

**TABLE XI.**—Average Velocity of the Wind in Miles per Hour for the Year and for each Month of the Year 1888, at 7 Stations in Michigan. Computed from Registers of the Robinson's Self-Registering Anemometer,\* by Observers for the State Board of Health, and for the U. S. Signal Service.

Stations in Michigan.†	Division of the State.	Miles, by Self-Registering Anemometer.													
		Year.		Months, in 1888.											
		Norm. ‡	1888.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 7 Stations.....	-----	-----	9.8	10.2	10.1	11.4	10.6	9.1	8.6	7.3	8.6	8.8	10.1	10.2	12.0
Marquette.....	U. P.	8.8 <sup>8</sup> <sub>7</sub>	8.3	10.0	8.1	8.8	9.0	6.5	6.7	6.3	8.1	9.3	8.6	8.5	10.2
Alpena.....	N. E.	9.2 <sup>1</sup> <sub>1</sub>	9.2	9.6	8.9	10.5	10.1	8.3	7.9	7.5	8.4	9.1	10.0	9.9	10.7
Grand Haven.....	W.	11.0 <sup>7</sup> <sub>7</sub>	11.3	11.7	11.2	13.2	12.3	10.1	10.0	7.8	9.9	9.4	12.7	11.9	15.0
Port Huron.....	B. & E.	9.8 <sup>9</sup> <sub>7</sub>	11.3	11.5	11.9	12.9	12.0	10.3	10.1	8.7	10.6	10.4	11.0	12.1	14.1
Lansing, S. B. of H...	C.	9.9 <sup>7</sup> <sub>7</sub>	9.6	9.2	10.0	11.5	10.7	9.1	8.9	7.6	8.5	8.3	10.2	9.3	11.7
Ann Arbor.....	S. C.	9.0 <sup>7</sup> <sub>7</sub>	8.9	9.5	10.0	11.5	10.1	9.2	7.4	5.7	7.0	7.2	8.4	9.2	11.1
Detroit.....	S. E.	9.4 <sup>7</sup> <sub>7</sub>	9.7	10.0	10.7	11.4	10.0	10.0	9.2	7.7	7.6	7.9	9.9	10.2	11.2

\* Gibbon's Anemometer was used at Ann Arbor.

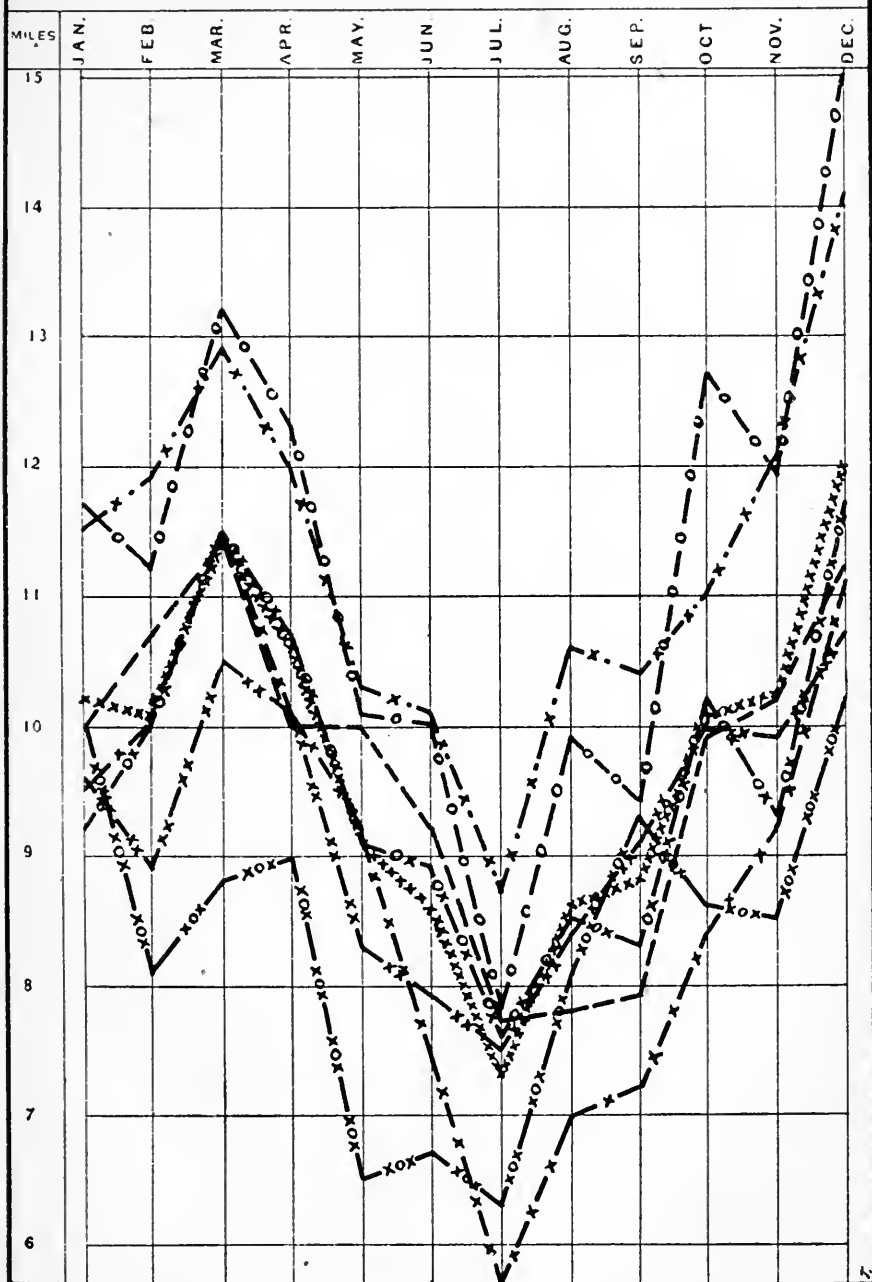
† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2.

‡ Numbers in this column state the average velocity of the wind in miles per hour for periods of years ending in each case with Dec. 31, 1887. The small figures above and at the right of numbers which state the average denote the number of years included in the average.

Graphic representations of statements made in Table XI., are given in Diagram XI., page 61.

DIAGRAM XI.—VELOCITY OF WIND, BY MONTHS, IN 1888.

AVERAGE MILES PER HOUR, BY REGISTERING ANEMONETER.—AT STATIONS IN MICHIGAN: ALPENA—xx, ANN ARBOR—x, DETROIT—, GRAND HAVEN—o—o, LANSING—ox—ox, MARQUETTE—xox—xox, PORT HURON—x—x; AV. FOR 7 STATIONS xxxxxx.



SCALE, ONE MILE PER HOUR TO .68 IN. VERTICALLY.

EXHIBIT 27.—Average Velocity of the Wind in Miles per Hour, by Months for the 8 Years, 1880-87, and comparisons of 1888 with this Average and with the Year 1887. From Registers of the Robinson's Self-Registering Anemometer in the office of the State Board of Health, State Capitol, Lansing, Michigan.

Years, etc.	Miles, by Self-Registering Anemometer.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av for 8 yrs., 1880-87	9.9	11.5	11.7	11.2	11.4	9.6	8.5	8.3	7.3	8.5	8.7	11.3	11.0
1887.....	9.8	12.6	12.6	9.7	12.2	7.4	7.5	7.8	6.0	7.7	10.8	12.5	10.7
1888.....	9.8	9.2	10.0	11.7	10.7	9.1	8.9	7.6	8.5	9.2	10.2	10.1	11.9
In 1888 <b>Greater</b> than Av. for 8 years, 1880-87.....	-----	-----	-----	.5	-----	-----	.4	-----	1.2	.7	1.5	-----	.9
In 1888 <b>Less</b> than Av. for 8 years, 1880-87.....	.1	2.3	1.7	-----	.7	.5	-----	.7	-----	-----	-----	1.2	-----
In 1888 <b>Greater</b> than in 1887.....	0	-----	-----	2.0	-----	1.7	1.4	-----	2.5	1.5	-----	-----	1.2
In 1888 <b>Less</b> than in 1887.....	0	3.4	2.6	-----	1.5	-----	-----	.2	-----	-----	.6	2.4	-----

EXHIBIT 28.—DIRECTION OF WIND, 1878-87.—Number of Observations per Month (made tri-daily), at which the Wind was blowing from the several (eight) points of Compass.—Annual and Monthly Averages for the 10 Years 1878-87, at Stations in Michigan.\*

Points of Compass.	Average Number of Observations per Month—10 Years, 1878-87.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All observations....	91	93	85	93	90	93	90	93	93	90	92	90	93
Calm.....	5	4	4	4	4	5	6	7	8	6	5	4	3
North.....	7	6	6	10	9	8	7	8	8	6	7	5	5
Northeast.....	8	6	7	9	12	12	9	8	10	7	7	6	5
East.....	6	5	6	7	9	8	6	5	6	6	5	4	5
Southeast.....	9	9	9	9	10	10	10	7	9	10	9	8	9
South.....	10	11	10	8	8	10	11	10	10	12	13	11	10
Southwest.....	17	22	15	13	12	16	15	18	16	18	19	20	22
West.....	14	16	14	14	11	12	13	16	12	12	13	18	18
Northwest.....	14	14	13	19	16	13	11	13	13	11	14	15	15

\*At 12 stations in 1878; 16 in 1879; 19 in 1880; 19 in 1881; 21 in 1882; 19 in 1883; 21 in 1884; 21 in 1885; 16 in 1886, and 17 in 1887.



TABLE XII.—Number of Observations per Month (at 7 A. M., 2 P. M., and 9 P. M.,\* Daily), at which the wind was blowing from each of the Eight Principal Points of Compass, during the Year and during each Month of the Year 1888. Average for 13 Stations in Michigan.†

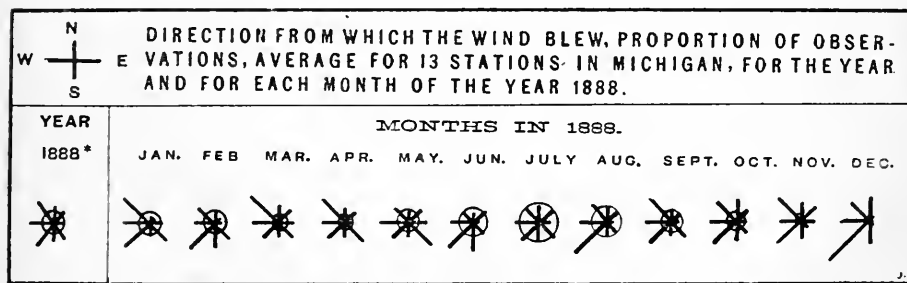
Points of Compass.	Average Number of Observations per Month, 1888.												
	Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All observations { (13 stations). } --	91	92	87	93	90	92	88	92	92	89	93	89	93
Calm. ....	6	6	7	4	4	6	7	10	8	6	5	2	2
North.....	8	4	5	9	8	5	5	9	9	7	12	10	12
Northeast.....	7	3	4	9	8	9	9	9	9	7	8	11	3
East.....	5	5	5	7	5	10	4	6	3	4	4	7	2
Southeast. ....	10	13	11	11	14	18	9	12	7	11	8	5	4
South.....	10	8	13	8	8	8	16	10	7	8	10	10	13
Southwest.....	17	19	19	12	12	12	19	13	23	16	17	17	29
West.....	14	15	11	15	13	15	12	13	15	14	14	11	15
Northwest.....	14	19	11	20	17	10	7	10	12	16	14	16	12

\* At stations of the U. S. Signal Service the observations for the first six months of the year 1888 were made at 7 A. M., 3 P. M., and 10 P. M., 75th meridian time; for the last six months at 8 A. M. and 8 P. M., 75th meridian time, and are not used in this table.

† The names of observers, their places of observation, and the counties and divisions of the State in which those places are situated are stated in Exhibit 1, page 2.

Graphic representations of statements in Table XII. are given in Diagram XIII., this page.

DIAGRAM XIII.—WIND, DIRECTION, IN MICH., YEAR AND MONTHS, 1888.

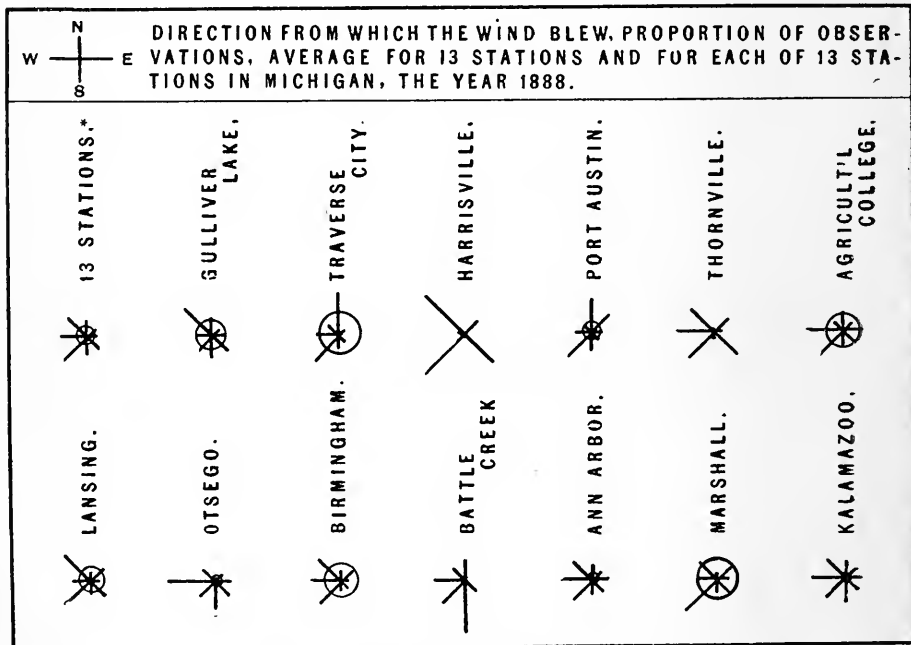


\* SCALE, RADIUS .01 OF ONE INCH TO ONE OBSERVATION.

The construction and purport of the diagrams relating to direction of wind may be explained as follows:

In Diagrams XII., XIII. and XIV., pages 66, 63 and 64, relating to the direction of the wind, the single figures or separate groups of lines are designed to indicate by the length of the lines the number and the proportion of regular observations at 7 A. M., 2 P. M. and 9 P. M., daily, at which the wind was blowing from each of the eight principal points of compass at the places and for the periods of time stated in the margin; and by the direction of the lines on the page, the direction of the wind. Each figure consists of lines drawn to a common center from some or all of the following directions on the page and indicating that at the times of observation the wind blew from points of the compass as follows: Lines toward the common center from the top of the page indicate observations that the wind was blowing from the north; from the right-hand side, observations that the wind was from the east; from the bottom of the page, that it was from the south; from the left-hand side, that it was from the west; from the upper left-hand corner, that it was from the northwest; from the upper right-hand corner, that it was from the northeast; from the lower right-hand corner, that it was from the southeast; from the lower left-hand corner, that it was from the southwest. The number of regular observations at which the wind was blowing from the direction denoted by a line is indicated by the length of that line, .01 of an inch being the unit or the length of line for one observation. The circles indicate calms, the number of regular observations at which there was no wind being denoted by the length of the radius of the circle drawn about the point of convergence of the lines for a given place or period of time, the length for one observation being, as before, .01 of an inch. Thus, by Diagram XII., page 66, or by Table XIV., pages 67-70, it appears that at Thornville in February, 1888, at one of the regular tri-daily observations for the month there was a calm; at 17 observations the wind was blowing from the west; at 18 from the northwest; at 2 from the northeast, etc. For convenient study the top of these diagrams should be held toward the north. Definite numerical statements corresponding to these diagrams are given in Tables XII., XIII. and XIV., pages 63, 65 and 67-70.

DIAGRAM XIV.—WIND, DIRECTION, AT STATIONS IN MICHIGAN. 1888.



\* SCALE, RADIUS .01 OF ONE INCH TO ONE OBSERVATION, NUMERICAL STATEMENTS CORRESPONDING TO LINES IN THIS DIAGRAM ARE GIVEN IN TABLE PAGE .

TABLE XII.—Average Number of Observations per Month for the Year 1888, at which the Wind was Blowing from each of the Eight Principal Points of the Compass, at each of 18 Stations\* in Michigan; also the Average lines for 13 Stations, and for 5 Stations.

Stations in Michigan.†	Divisions of the State.‡	Average Number of Observations Per Month in 1888.									
(Those of the U. S. Signal Service in Italics.)		All Obs.	Calms	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Av. for 13 Stations.....		91	5	8	7	5	10	10	17	14	14
Av. for 5 Stations.....§		76	1	8	7	7	8	10	9	13	14
<i>Marquette</i> .....	U. P.	76	2	7	5	5	7	9	6	11	24
Gulliver Lake.....	U. P.	92	8	9	5	6	13	13	11	7	20
Traverse City.....	N. W.	89	11	22	4	2	5	7	18	11	9
<i>Alpena</i> .....	N. E.	76	1	6	3	7	13	6	7	20	13
Harrisville.....	N. E.	92	0	0	10	0	22	2	28	2	28
<i>Grand Haven</i> .....	W.	76	0	8	8	10	10	10	9	10	12
Port Austin.....	B. & E.	89	5	17	13	6	6	10	18	9	5
<i>Port Huron</i> .....	B. & E.	76	1	11	7	6	6	13	11	12	10
Thornville.....	B. & E.	92	1	1	10	5	16	3	19	20	17
Agricultural College.....	C.	91	9	10	7	8	6	7	18	19	9
Lansing, S. B. of H.....	C.	92	7	5	9	4	11	8	19	10	18
Otsego.....	S. W.	90	3	2	5	8	11	15	12	25	9
Ann Arbor.....	S. C.	92	3	9	6	8	8	9	15	18	14
Battle Creek.....	S. C.	92	0	11	1	2	9	28	17	16	8
Kalamazoo.....	S. C.	92	3	8	7	7	9	14	14	18	13
Marshall.....	S. C.	92	11	3	10	6	11	7	22	9	13
Birmingham.....	S. E.	87	9	6	9	5	6	6	16	15	16
<i>Detroit</i> .....	S. E.	76	1	7	10	8	3	11	12	12	13

\* At the Stations of the U. S. Signal Service the observations for the first six months of the year 1888 were made at 7 A. M., 3 P. M., and 10 P. M., 75th meridian time; and for the last six months at 8 A. M., and 8 P. M., 75th meridian time.

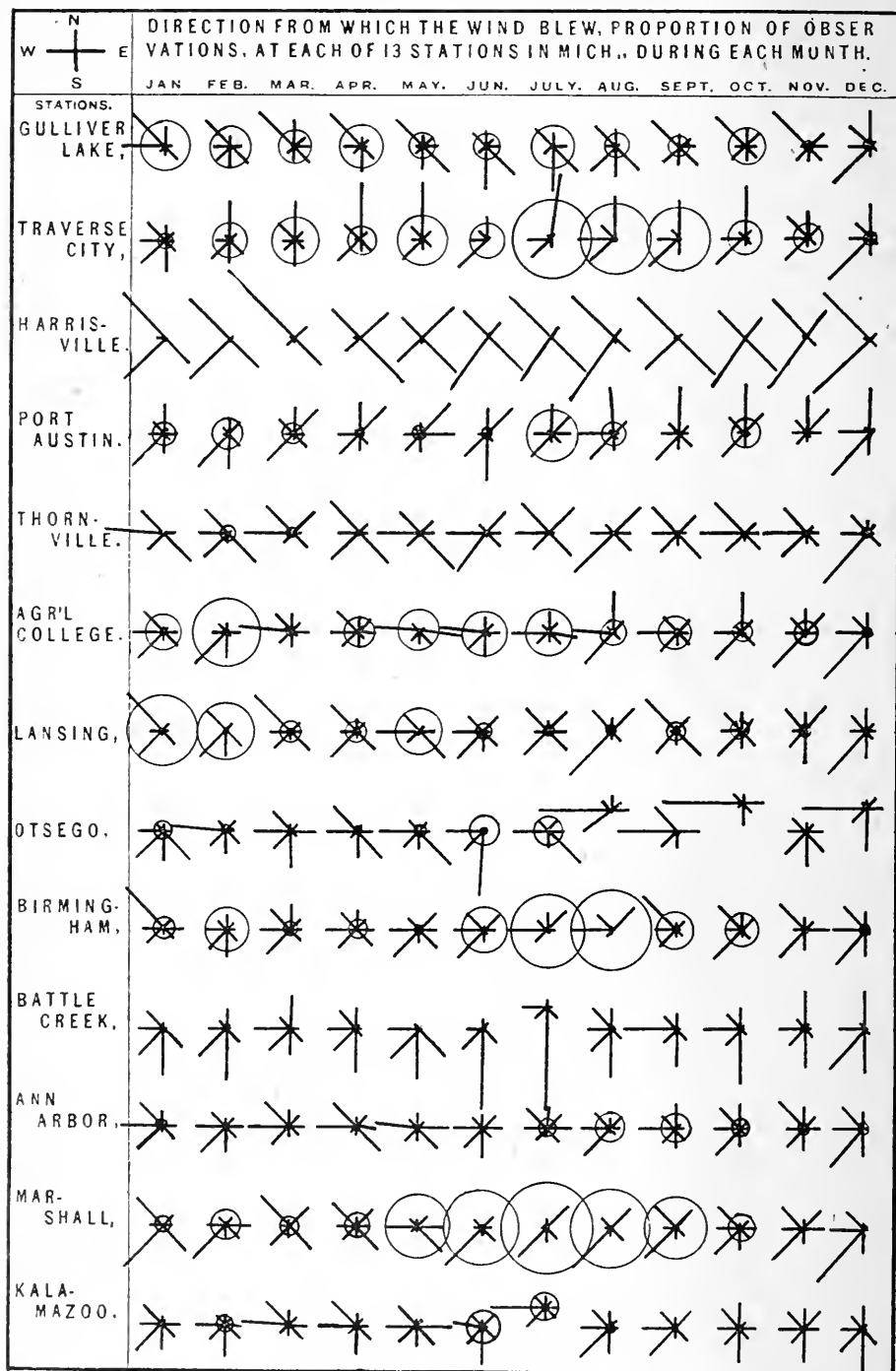
† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit I, page 2.

‡ The full names of the divisions, and the counties in each division, are stated in Exhibit I, in a paper which follows on weekly reports of sickness.

§ This is an average line for the 5 U. S. Signal Service Stations only.

Graphic representations of statements in Table XIII. are given in Diagram XIV., page 64.

DIAGRAM XII.-WIND, DIRECTION. AT STATIONS, BY MONTHS. 1888.



SCALE RADIUS .01 OF ONE INCH TO ONE OBSERVATION.

TABLE XIV.—Number of Observations for each Month of the Year 1888, at which the wind was Blowing from each of the eight Principal Points of the Compass, at each of the 18 Stations\* in Michigan; also the Average Lines for 13, and for 5 of the said Stations from which nearly Complete Observations were received for the Year. (Observations were made at 7 A. M., 2 P. M., and 9 P. M., Daily,†)

Stations in Michigan. (Those of U. S. Signal Service in Italics.)	Divi- sions of the State.*	January.										February.										March.									
		Total.		N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.		N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.		N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
		Calms.										Calms.										Calms.									
Ar. 13 Stations.†	-----	92	6	4	3	5	13	8	19	15	19	87	7	5	4	5	11	13	19	11	11	93	4	9	9	7	11	8	12	15	20
Ar. 5 Stations §	-----	93	0	7	5	7	11	6	12	20	24	87	1	7	4	9	7	16	12	17	13	93	1	12	9	10	7	9	6	19	20
Marquette.....	U. P.	93	0	1	0	2	6	11	5	27	41	87	3	7	5	3	2	16	10	13	28	93	1	10	11	11	3	14	0	10	33
Gulliver Lake....	U. P.	93	13	10	0	4	10	5	4	23	24	87	11	6	1	6	13	11	10	9	20	93	9	14	7	9	11	9	6	2	26
Traverse City....	N. W.	93	5	8	5	5	8	16	18	14	14	87	10	21	5	2	11	12	14	8	4	93	13	21	6	5	6	14	8	7	13
Alpena.....	N. E.	93	1	5	2	9	5	7	16	40	8	87	1	3	1	6	16	13	8	29	10	93	1	8	3	10	13	4	4	31	19
Harrisville.....	N. E.	93	0	2	0	0	19	1	31	7	33	87	0	0	2	0	21	1	31	2	30	93	0	1	9	0	21	3	6	3	50
Grand Haven....	W.	93	0	13	9	16	18	3	10	7	17	87	0	10	2	16	12	14	6	20	7	93	0	12	11	12	13	5	7	13	30
Port Austin.....	B. & E.	87	6	16	3	6	4	11	24	8	9	87	8	8	8	0	9	19	25	4	6	93	6	14	18	6	10	4	20	5	10
Port Huron.....	B. & E.	93	0	4	4	3	12	7	22	11	30	87	0	8	3	8	6	21	18	12	11	93	1	19	6	7	5	13	9	22	11
Thornville.....	B. & E.	93	0	0	1	7	21	0	13	32	19	87	4	0	2	1	21	6	18	17	18	93	3	0	16	5	11	3	8	27	30
Agri College....	C.	93	10	3	3	8	11	6	20	17	15	87	18	5	0	8	3	14	24	9	6	93	3	9	7	11	5	9	9	28	12
Lansing, S. B. of H.	C.	93	19	0	5	4	10	2	19	7	27	87	15	0	6	2	12	14	20	3	15	93	6	2	7	6	14	5	13	12	28
Osego.....	S. W.	91	5	3	1	4	22	16	21	14	5	86	3	0	7	3	11	13	13	30	6	93	1	3	5	14	4	20	12	20	14
Ann Arbor.....	S. C.	93	3	8	2	8	10	4	18	23	17	87	0	4	6	9	8	15	19	16	10	93	1	9	7	8	7	6	14	22	19
Battle Creek....	S. O.	93	1	3	0	1	15	26	20	14	13	87	0	10	1	2	10	28	21	10	5	93	0	18	0	4	10	15	17	20	9
Kalamazoo.....	S. C.	93	2	5	4	10	10	14	20	13	15	87	5	5	5	9	11	17	12	16	7	93	1	8	7	10	11	6	6	26	18
Marshall.....	S. C.	96	4	0	7	3	19	1	31	8	20	87	8	1	5	14	11	7	25	10	6	93	5	4	15	2	17	7	15	5	23
Birmingham....	S. E.	88	6	0	5	11	8	4	12	12	30	85	12	8	5	4	8	15	14	12	7	93	4	13	7	6	9	3	19	17	15
Detroit.....	S. E.	93	0	11	8	6	13	3	7	23	22	87	0	5	7	13	1	18	19	13	11	93	0	11	14	9	2	9	9	20	19

Diagram XII, page 64, gives 13 lines in this table, and is explained on page 61. \* For Names of observers, etc., see Exhibit I, page 2. For names of divisions etc., see Exhibit I, page 3. † This line includes only the 13 stations, at which observations were made tri-daily, and from which statements complete, or nearly complete, were received for every month of the year; it does not include the U. S. Signal Service Stations. ‡ This is an average line for the 5 U. S. Signal Service Stations.



TABLE XIV.—CONTINUED.—*Direction of Wind, Months in 1888.—Observations at which the Wind was Blowing from Directions Named.*

Stations in Michigan,* (Those of U. S. Signal Service in Italics.)	Divi- sions of the State.*	July.										August.										September.														
		Calm.					N. E.					E.					S. E.					S. W.					W.					N. W.				
		Total.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.						
Av. 13 Stations†.		92	10	9	6	12	10	13	13	10	92	8	9	9	3	7	7	23	15	12	89	6	7	7	4	11	8	16	14	16						
Av. 5 Stations‡.		62	2	6	9	4	9	8	8	7	62	2	7	7	4	4	7	12	8	11	60	1	5	4	6	8	6	8	12	10						
Marquette.....	U. P.	62	3	4	2	8	11	10	9	8	7	62	2	5	6	2	8	5	6	10	18	60	1	4	5	4	8	5	5	13	15					
Gulliver Lake...	U. P.	93	12	7	2	8	19	24	6	2	13	93	7	9	1	1	18	17	19	6	15	90	6	7	9	15	11	13	2	20						
Traverse City....	N. W.	93	21	35	3	0	0	4	15	13	2	93	19	23	1	1	0	2	16	21	10	90	17	21	3	0	1	9	21	12	6					
Albion.....	N. E.	62	4	2	3	4	19	1	4	10	15	62	0	6	5	4	4	2	11	13	17	60	0	3	0	6	10	6	6	15	14					
Harrisville.....	N. E.	93	0	0	6	0	26	1	28	1	31	93	0	0	5	0	12	3	41	1	31	90	0	0	4	0	28	1	24	3	30					
Grand Haven....	W.	62	0	3	9	4	11	8	8	7	12	62	0	6	6	8	4	12	10	6	10	60	1	8	4	6	10	4	12	7	8					
Port Austin.....	B. & E.	92	14	16	13	11	7	5	15	9	2	93	7	25	9	3	4	9	18	18	0	89	1	25	6	5	10	9	19	8	6					
Port Huron.....	B. & E.	62	1	15	13	2	2	11	8	5	5	62	3	13	6	3	1	12	12	5	7	60	1	5	5	8	7	9	7	15	3					
Thornville.....	B. & E.	93	2	0	18	2	17	0	13	19	22	93	1	0	20	9	13	0	30	13	7	90	2	0	13	3	18	6	14	14	20					
Agri'l College....	C.	93	13	11	7	15	9	5	9	20	4	92	7	22	8	1	5	0	23	22	4	90	9	3	10	6	9	7	13	22	11					
Lansing, S. P. of Ill.	C.	93	3	6	15	10	14	3	18	8	16	93	3	8	17	2	7	4	33	3	16	90	5	4	10	1	18	8	17	4	23					
Otsego.....	S. W.	89	8	2	8	9	24	9	2	19	8	93	2	7	6	9	1	0	21	39	8	87	0	0	1	12	3	10	12	32	17					
Ann Arbor.....	S. C.	93	5	12	11	13	10	5	9	13	15	93	8	5	9	5	4	3	21	16	12	90	8	14	4	4	8	11	11	20	10					
Battle Creek....	S. C.	93	1	5	0	1	8	55	9	12	2	93	0	11	1	3	8	26	16	13	15	90	1	9	2	2	7	20	10	29	10					
Kalamazoo.....	S. C.	93	8	7	5	6	8	6	14	30	9	93	3	9	6	5	3	14	23	16	14	90	1	6	14	2	10	6	21	18	12					
Marshall.....	S. C.	93	25	5	17	1	9	8	22	3	3	93	21	2	15	0	10	5	29	3	8	90	16	1	13	2	6	23	7	16						
Birmingham....	S. E.	89	20	10	14	3	1	2	9	22	8	81	22	2	17	2	0	2	4	21	11	80	10	3	6	2	5	4	13	12	25					
Detroit.....	S. E.	62	0	7	19	4	2	8	10	7	5	62	3	7	13	3	1	5	20	6	4	60	4	3	8	6	6	7	8	10	8					

\* &amp; † For these references see foot-notes to this table on page 47.

NOTE.—Graphic representations of statements for 13 lines in this table are given in Diagram XII., page 66, which is explained on page 64.

TABLE XIV.—CONCLUDED.—Direction of Wind, Months in 1888.—Observations at which the Wind was Blowing from Directions Named.

Stations in Michigan.* (Those of U. S. Sig- nal Service in Italics.)	Divis- ions of the State.*	October.										November.										December.																
		N.					S. E.					S. S. W.					W.					N. W.					N. E.					S. E.						
		Calm.	N.	N. E.	E.	S. E.	S. S. W.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S. S. W.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S. S. W.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S. S. W.	W.	N. W.	Total.	
Av. 13 Stations†.		93	5	12	8	4	8	10	17	14	14	89	2	10	11	7	5	10	17	11	16	93	2	12	3	2	4	13	29	15	12							
Av. 5 Stations‡.		62	0	7	6	5	7	7	7	10	13	60	0	6	6	7	5	9	6	9	13	62	0	5	4	2	3	13	12	12	13							
Marquette.....	U. P.	62	1	8	2	2	8	5	3	12	21	60	0	6	6	5	8	7	4	9	15	62	0	7	4	0	2	8	10	13	18							
Gulliver Lake.....	U. P.	93	10	10	5	9	9	11	6	23	90	3	3	11	11	11	10	10	4	27	93	3	19	3	2	4	6	29	13	14								
Traverse City.....	N. W.	93	9	28	5	1	5	5	22	14	4	90	8	15	9	2	5	5	17	13	16	93	4	19	1	1	6	9	31	11	11							
Alpena.....	N. E.	62	0	6	4	6	8	4	5	16	13	60	0	5	8	7	4	4	6	15	11	62	0	7	1	2	2	11	12	18	9							
Harrisville.....	N. E.	93	0	0	14	0	24	2	33	0	20	90	0	0	17	0	7	1	35	3	27	93	0	0	5	0	6	2	42	4	34							
Grand Haven.....	W.	62	0	11	13	7	7	8	1	8	7	60	0	9	11	7	5	10	6	3	9	62	0	7	11	4	6	10	10	9	5							
Port Austin.....	B. & E.	93	8	26	13	3	3	7	17	5	11	78	1	20	16	7	4	5	8	8	9	93	0	24	5	2	2	11	29	16	4							
Port Huron.....	B. & E.	62	0	2	10	3	10	5	12	10	10	60	1	2	4	7	6	11	7	10	12	62	1	1	0	3	2	17	13	10	15							
Thornville.....	B. & E.	93	0	0	7	7	12	5	15	24	23	90	1	2	5	6	9	6	18	24	19	93	3	6	5	3	9	2	36	15	14							
Agri'l College.....	C.	93	5	22	9	2	9	3	21	16	6	89	6	13	14	5	0	3	25	11	12	93	3	11	3	3	2	9	33	17	12							
Lansing, S. B. of H.....	C.	93	5	11	9	3	11	10	18	12	14	90	4	10	18	2	3	18	12	7	16	93	0	13	6	5	5	14	29	9	12							
Otsego.....	S. W.	93	1	5	2	12	7	13	4	42	7	90	0	5	6	9	14	18	16	11	11	93	0	3	7	9	1	24	11	34	4							
Ann Arbor.....	S. C.	93	5	14	6	4	5	10	19	14	16	90	4	12	9	8	3	12	12	10	20	93	4	10	1	1	1	15	27	17	17							
Battle Creek.....	S. C.	93	0	12	3	2	4	29	12	20	11	92	0	21	4	4	6	21	12	15	7	93	0	21	0	1	2	23	28	14	4							
Kalamazoo.....	S. C.	93	0	14	6	9	7	18	12	12	15	90	0	12	13	8	2	18	10	14	13	93	1	12	3	1	11	26	16	13	10							
Marshall.....	S. C.	93	7	4	6	9	7	11	19	13	17	90	0	5	13	11	0	8	23	13	17	93	0	3	2	3	2	14	38	18	13							
Birmingham.....	S. E.	87	9	8	9	1	6	5	22	9	18	86	1	7	6	13	1	11	20	7	20	91	3	10	2	0	3	14	24	18	17							
Detroit.....	S. E.	62	1	9	1	7	1	11	15	5	12	60	0	10	3	7	1	12	5	6	16	62	0	3	2	0	1	17	13	10	16							

\* † § For these references see foot-note to this table on page 67.

NOTE.—Diagram XII., page 96, exhibits lines showing, by months, directions of wind at each of 13 stations in this table, the cut for each month and station in said diagram representing the figures given in this table for the same month and station; it is explained on page 64.



TABLE XV.—Average Daily Range of Atmospheric Pressure (as determined from three daily observations\*) for the Year 1888, at each of 17 Stations, and the average lines for 12 Stations and for 5 Stations in Michigan.—Stations arranged in order by Latitude, those farthest North first.

Stations in Michigan.†	Average Daily Range of Barometer—Year and Months, 1888.														
(Those of the U. S. Signal Service in Italics.)	Norm. ‡	1887.	1888.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 12 Stations.....§	-----	-----	.207	.332	.302	.228	.240	.172	.137	.105	.137	.189	.217	.206	.223
Av. for 5 Stations.....	-----	-----	.213	.343	.320	.232	.242	.178	.138	.113	.149	.186	.224	.201	.236
Marquette .....	-----	.227	.226	.335	.360	.218	.235	.177	.147	.137	.185	.205	.252	.189	.268
Gulliver Lake .....	-----	-----	.216	.334	.325	.219	.225	.163	.134	.119	.150	.202	.256	.199	.261
Alpena.....	.225 6	.231	.225	.347	.335	.246	.239	.183	.153	.121	.153	.198	.251	.225	.246
Traverse City.....	.220 7	.222	.219	.332	.349	.231	.232	.172	.169	.110	.151	.200	.232	.206	.243
Harrisville .....	.233 4	.239	.240	.368	.341	.258	.266	.214	.160	.139	.162	.213	.256	.251	.249
Port Austin.....	-----	-----	.228	.378	.311	.248	.271	.173	.160	.118	.131	.215	.230	.267	.236
Grand Haven.....	.207 6	.211	.204	.337	.365	.213	.239	.174	.128	.107	.138	.175	.215	.186	.227
Port Huron.....	.214 5	.220	.209	.350	.309	.250	.247	.177	.135	.103	.134	.179	.204	.204	.221
Thornville.....	.208 6	.216	.209	.347	.323	.224	.237	.174	.134	.100	.138	.190	.210	.220	.227
Agricultural College....	.203 7	.207	.198	.327	.292	.218	.237	.176	.123	.093	.124	.178	.210	.183	.212
Lansing, S. B. of H.....	.205 2	.204	.201	.335	.281	.222	.234	.169	.131	.099	.141	.181	.207	.198	.218
Birmingham.....	.209 6	.213	.204	.330	.302	.237	.238	.169	.133	.103	.135	.184	.205	.194	.218
Detroit.....	.210	.211	.204	.345	.293	.232	.249	.178	.128	.096	.134	.171	.199	.202	.217
Battle Creek.....	-----	.179	.280	.273	.202	.233	.150	.110	.076	.117	.189	.187	.179	.150	.150
Ann Arbor.....	.205 6	.210	.201	.334	.291	.229	.240	.169	.127	.101	.128	.172	.207	.197	.214
Marshall .....	.206 4	.199	.195	.311	.280	.233	.231	.171	.138	.094	.124	.167	.197	.179	.219
Kalamazoo.....	.188	.190	.198	.308	.275	.209	.237	.168	.129	.102	.140	.172	.206	.196	.230

\* At Stations of the U. S. Signal Service the observations for the first six months of the year 1888 were made at 7 A. M., 3 P. M., and 10 P. M., 75th Meridian time, and for the last six months at 8 A. M., and 8 P. M., 75th Meridian time. The corresponding local time for each of these stations is stated in star (\*) foot-note to Table I., page 19.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2. The average atmospheric pressure at each of these stations, by months, in 1888, is given in Table XVII., page 76.

‡ Numbers in this column state the average daily range of atmospheric pressure for periods of years ending in each case with Dec. 31, 1888. The small figures above and at the right of numbers which state the average daily range, denote the number of years included in the average.

§ Not including the U. S. Signal Service Stations.

|| This line is an average for the 5 U. S. Signal Service Stations.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 23 days. g For 1 days.

NOTE.—The latitude and elevation of some of these stations are stated in Exhibit 2, page 3.

TABLE XVI.—*Range of Atmospheric Pressure (as determined from 3 Daily Observations\*) for the Year and for each Month and for the Average Month of the year 1888, at 17 and at each of the 17 Stations†, and Average lines for 12 Stations and for 5 Stations in Michigan; also the Norm.—Average Monthly Range for a series of years. Stations named in order by Latitude, those farthest North first.*

Stations in Michigan.‡ (Those of the U. S. Signal Service in Italics.)	Range of Barometer.—Year and Months, 1888.															
	Norm. §	1887.	1888.	Av. Month	Jan.	Feb.	Mar.	Apr.	May	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
For 12 Stations	.....	.....	2.060	1.386	1.699	2.060	1.515	1.576	1.266	.984	.959	1.033	1.301	1.394	1.495	1.354
Av. for 12 Stations ¶	.....	.....	1.618	.916	1.283	1.609	1.062	1.003	.807	.609	.451	.603	.886	.933	.801	.940
Av. for 5 Stations **	.....	.....	1.641	.952	1.398	1.629	1.093	.977	.889	.647	.445	.561	.862	.959	1.016	.954
Marquette.....	.....	1.706	1.623	.962	1.399	1.623	1.126	.916	1.023	.695	.486	.648	.919	.883	.931	.890
Gulliver Lake.....	.....	1.702	1.012	1.453	1.702	1.147	.872	.872	.729	.459	.702	1.014	1.084	1.052	1.060	
Alpena.....	1.139 <sup>6</sup>	1.906	1.670	1.071	1.430	1.670	1.220	1.020	1.010	.770	.500	.568	1.000	1.030	1.110	1.030
Traverse City.....	1.105 <sup>7</sup>	1.889	1.725	.908	1.404	1.725	1.174	.954	.805	.712	.599	.642	.982	.973	.068	1.038
Harrisville.....	1.195 <sup>4</sup>	1.830	1.682	.950	1.472	1.678	1.083	1.090	.970	.724	.557	.605	1.026	.998	.177	1.015
Port Austin.....	.....	.....	1.677	.894	1.259	1.677	1.109	1.038	.784	.697	.616	.608	.965	.806	.156	1.014
Grand Haven.....	1.043 <sup>7</sup>	1.699	1.660	.927	1.370	1.650	1.060	.960	.760	.600	.410	.530	.760	.940	1.070	1.010
Port Huron.....	1.092 <sup>6</sup>	1.814	1.620	.933	1.410	1.590	1.060	1.030	.840	.570	.430	.550	.840	.990	1.000	.880
Thornville.....	1.095 <sup>6</sup>	1.632	1.595	.917	1.219	1.581	1.007	1.007	.795	.539	.444	.597	.850	.955	1.033	.978
Agr'l College.....	1.038 <sup>7</sup>	1.608	1.619	.918	1.262	1.619	1.070	.983	.837	.574	.390	.564	.781	.953	1.049	.933
Lansing, S. B. of H.	1.023 <sup>2</sup>	1.624	1.600	.906	1.270	1.600	1.068	.978	.799	.578	.396	.599	.781	.888	1.026	.887
Birmingham.....	1.289 <sup>6</sup>	1.645	1.566	.917	1.296	1.556	.970	.948	.802	.613	.445	.611	.814	.946	1.025	.972
Detroit.....	1.059 <sup>6</sup>	1.638	1.630	.912	1.380	1.610	1.000	.960	.810	.600	.400	.510	.790	.950	.970	.960
Battle Creek.....	.....	.....	1.543	.871	1.127	1.478	.974	1.306	.733	.499	.346	.537	1.001	.899	.929	.627
Ann Arbor.....	1.016 <sup>7</sup>	1.589	1.577	.904	1.277	1.577	.974	.944	.781	.577	.536	.599	.775	.910	1.017	.876
Marshall.....	1.032 <sup>4</sup>	1.651	1.600	.892	1.103	1.589	1.098	.990	.768	.527	.358	.591	.862	.884	1.012	.918
Kalamazoo.....	1.051	1.641	1.527	.899	1.249	1.521	1.066	.927	.740	.540	.471	.575	.783	.905	1.047	.958

§ Numbers in this column state the average monthly range of atmospheric pressure for a period of years ending in each case with Dec. 31, 1888. The small figures above and at the right of numbers which state the average, denote the number of years included in the average.

|| Represents the difference between the highest of 12 stations and the lowest of 12 stations for year and for each month of year, not including the U. S. Signal Service Stations.

¶ Represents sum of ranges at 12 stations divided by 12.

\*\* An average for only the 5 U. S. Signal Service Stations.

NOTE.—The \*, †, ‡ and a b c references and the note to Table XV., page 71, apply also to Table XVI.

EXHIBIT 29.—Average Atmospheric Pressure, by Year and Months, in 1888, Compared with Annual and Monthly Averages for 1887, and for the Eleven Years, 1877-87. These Averages are for Groups of Several Stations in Michigan.

Years, etc.	Average Atmospheric Pressure.—Inches of Mercury.												
	Annua- al Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 11 years, 1877-87*	29.163	29.196	29.201	29.153	29.127	29.131	29.115	29.120	29.151	29.198	29.200	29.176	29.185
1887 (15 stations)....	29.215	29.118	29.310	29.250	29.152	29.204	29.203	29.188	29.234	29.305	29.185	29.211	29.218
1888 (12 stations)....	29.158	29.278	29.129	29.203	29.250	29.065	29.069	29.166	29.144	29.174	29.070	29.202	29.143
In 1888 <b>Greater</b> than Av. for 11 years, 1877-87.....	-----	.082	-----	.050	.123	-----	-----	.046	-----	-----	-----	.026	-----
In 1888 <b>Less</b> than Av. for 11 years, 1877-87.....	.005	-----	.072	-----	-----	.066	.046	-----	.007	.024	.130	-----	.042
In 1888 <b>Greater</b> than in 1887.....	-----	.160	-----	-----	.098	-----	-----	-----	-----	-----	-----	-----	-----
In 1888 <b>Less</b> than in 1887.....	.057	-----	.181	.047	-----	.139	.134	.022	.090	.131	.115	.009	.075

\* Kalamazoo for 1877-82 and 1885-7; Battle Creek for 1877-80, and 1882; Detroit for 1878-87; Woodmere Cemetery (near Detroit) for 1877-9; Mendon for 1877-8 and 1881-3; Marquette for 1879-81, and 1886-7; Alpena, Grand Haven, Port Huron, Lansing for 1879-87; Benton Harbor for 1877-8; Ypsilanti for 1877 and 1879; Agricultural College for 1877, 1881-7; Otisville for 1878-80 and 1882; Tecumseh for 1879-80 and 1882-5; Washington for 1879-80 and 1882-3; Nirvana for 1879 and in 1880 to April 25, inclusive; Reed City, for 1880 after April 25, and 1881-5; Thornville, for 1880-1 and 1884-7; Escanaba for 1880 and 1882-7; Ann Arbor for 1881-7; Traverse City, for 1882-7; Harrisville for 1882 and 1885-7; Hastings for 1882; Hillsdale for 1882-3; Port Austin for 1883-4; Marshall for 1883-7; Manistique, Ionia for 1884-5; Mackinaw City for 1884-7; Swartz Creek for 1885; Birmingham for 1887.

EXHIBIT 30.—*Comparisons of the Average Atmospheric Pressure during the Year and during each Month of the Year 1888, with Averages for the 13 Years, 1875-87, and for the Year 1887. Corrected for Temperature and for Instrumental Error. Observations made at 7 A. M., 2 P. M., and 9 P. M., daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich.*

Years, etc.	Average Atmospheric Pressure.—Inches of Mercury.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 13 yrs., 1875-87.	29.063	29.076	29.072	29.017	29.022	29.039	29.039	29.053	29.071	29.113	29.089	29.077	29.089
1887.....	29.092	29.087	29.163	29.105	29.035	29.083	29.094	29.091	29.104	29.187	29.090	29.083	29.083
1888.....	29.108	29.202	29.070	29.154	29.202	29.023	29.032	29.119	29.103	29.128	29.027	29.167	29.070
In 1888 <b>Greater</b> than Av. for 13 yrs., 1875-87.....	.045	.126	.....	.137	.180	.....	.....	.066	.032	.015	.....	.090	.....
In 1888 <b>Less</b> than Av. for 13 years, 1875-87.....	.....	.....	.002	.....	.....	.016	.007	.....	.....	.....	.062	.....	.019
In 1888 <b>Greater</b> than in 1887.....	.016	.215	.....	.049	.167	.....	.....	.028	.....	.....	.....	.084	.....
In 1888 <b>Less</b> than in 1887.....	.....	.....	.092	.....	.....	.060	.062	.....	.001	.059	.063	.....	.013

EXHIBIT 31.—*Average Daily Range of Atmospheric Pressure by Year and Months, in 1888, compared with Annual and Monthly Averages for 1887, and for the six years, 1882-87. These Averages are for Groups of several Stations in Michigan.*

Years, etc.	Average Daily Range of Barometer.—Year and Months, 1888.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 6 years, 1882-87*.	.213	.319	.319	.282	.204	.161	.142	.121	.133	.164	.210	.240	.259
1887 (15 stations)....	.217	.344	.417	.254	.228	.123	.118	.113	.111	.176	.219	.257	.250
1888 (12 stations)....	.207	.332	.302	.228	.240	.172	.137	.105	.137	.189	.217	.206	.223
In 1888 <b>Greater</b> than Av. for 6 years, 1882-87.....	-----	.013	-----	-----	.036	.011	-----	-----	.004	.025	.007	-----	-----
In 1888 <b>Less</b> than Av. for 6 years, 1882-87.....	.006	-----	.017	.054	-----	-----	.005	.016	-----	-----	-----	.034	.036
In 1888 <b>Greater</b> than in 1887.....	-----	-----	-----	-----	.012	.049	.019	-----	.026	0.13	-----	-----	-----
In 1888 <b>Less</b> than in 1887.....	.010	.012	.115	.026	-----	-----	-----	.008	-----	-----	.002	.051	.027

\* Marquette for 1882-4 and 1886-7; Escanaba, Traverse City, Grand Haven, Lansing, Ann Arbor for 1882-7; Reed City, Tecumseh for 1882-5; Alpena, Port Huron, Agricultural College, Detroit, Marshall for 1883-7; Port Austin for 1883-4; Washington and Mendon for 1883; Manistique, Ionia for 1884-5; Mackinaw City, Thornville, for 1881-7; Harrisville for 1885-7; Swartz Creek for 1885; and Birmingham for 1887.

EXHIBIT 32.—*Range of Atmospheric Pressure, by Year and Months, in 1888, compared with Annual and Monthly Averages for 1887; and for the six years 1882-87. These Averages are for Groups of Several Stations in Michigan.*

Range of Barometer.—Year and Months, 1888.													
Years, etc.	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 6 years, 1882-87*.	.954	1.206	1.278	1.207	1.066	.756	.716	.560	.628	.824	1.013	1.103	1.148
1887 (15 stations).....	1.062	1.302	1.646	1.260	1.224	.731	.782	.549	.531	.836	1.006	1.599	1.273
1888 (12 stations).....	.916	1.283	1.609	1.062	1.003	.807	.609	.451	.603	.886	.933	.801	.940
In 1888 <b>Greater</b> than average for 6 years, 1882-87.....		.077	.331			.051				.062			
In 1888 <b>Less</b> than average for 6 yrs., 1882-87.....	.038			.145	.063		.107	.109	.025		.080	.302	.208
In 1888 <b>Greater</b> than in 1887.....						.076			.072	.050			
In 1888 <b>Less</b> than in 1887.....	.146	.019	.037	.198	.221		.173	.098			.073	.798	.333

\* Marquette for 1882-4 and 1886-7; Escanaba, Traverse City, Grand Haven, Lansing, Ann Arbor for 1882-7; Reed City, Tecumseh for 1882-5; Alpena, Port Huron, Agricultural College, Detroit for 1883-7; Port Austin for 1883-4; Washington, Mendon for 1883; Marshall for 1883-5 and 1887; Manistique, Ionia for 1884-5; Mackinaw City, Thornville for 1884-7; Harrisville for 1885-7; Swartz Creek for 1885; Birmingham for 1887.

TABLE XVII.—Average Atmospheric Pressure for the Year, and for each Month in the Year 1888, at each of 17 Stations in Michigan; also Average lines for 12 Stations and for 5 Stations, as indicated by the height, in inches, of Mercury in the Barometer. Corrected for Temperature.—Reduced to 32° F. (For some Stations not corrected for Instrumental Errors\*)—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M., and 9 P. M.,† by observers‡ for the State Board of Health and for the U. S. Signal Service.

Stations in Michigan:† (Those of the U. S. Signal Service in Italics.)	Divisions of the State,§	Years.		Months, 1888.											
		Norm.	1888.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
				29,158	29,129	29,203	29,250	29,065	29,069	29,166	29,144	29,174	29,070	29,202	29,143
Av. for 12 Stations **	-----		29,348	29,471	29,319	29,308	29,440	29,252	29,246	29,346	29,321	29,360	29,267	29,429	29,327
Av. for 5 Stations **	-----														
Marquette*	U. P.	29,272 3	29,290	29,418	29,248	29,360	29,402	29,198	29,177	29,283	29,276	29,296	29,217	29,388	29,243
Gulliver Lake	U. P.	29,319	29,349	29,444	29,282	29,430	29,430	29,240	29,213	29,321	29,328	29,318	29,237	29,404	29,262
Traverse City	N. W.	29,338 1	29,349	29,481	29,317	29,413	29,448	29,250	29,227	29,358	29,340	29,352	29,268	29,419	29,308
Alpena*	N. E.	29,355 16	29,367	29,484	29,335	29,427	29,464	29,291	29,269	29,389	29,352	29,377	29,263	29,454	29,326
Harrisville	N. E.	29,310 4	29,336	29,457	29,312	29,385	29,432	29,270	29,241	29,329	29,328	29,342	29,251	29,416	29,289
Grand Haven*	W.	29,340 16	29,354	29,485	29,324	29,408	29,454	29,285	29,268	29,368	29,355	29,377	29,287	29,444	29,356
Port Austin	B. & E.	29,358	29,378	29,475	29,308	29,412	29,454	29,259	29,274	29,345	e 29,315	e 29,400	e 29,277	e 29,405	e 29,314
Port Huron*	B. & E.	29,329 10	29,370	29,497	29,354	29,411	29,455	29,275	29,271	29,366	e 29,340	e 29,400	e 29,277	e 29,441	e 29,357
Thornville	B. & E.	29,357 9	29,364	29,482	29,327	29,396	29,457	29,283	29,280	29,381	29,343	29,385	29,281	29,425	29,334
Agricultural College*	C.	29,092 10	29,106	29,202	29,070	29,154	29,202	29,023	29,032	29,119	29,108	29,128	29,027	29,167	29,070
Laings, S. V. of H.	C.	29,050 10	29,092	29,219	29,040	29,130	29,179	29,995	29,009	29,108	29,082	29,103	29,007	29,159	29,053
Ann Arbor	S. C.	29,019 8	29,019	29,159	29,017	29,075	29,127	29,951	29,964	29,055	29,035	29,061	29,957	29,805	29,027
Battle Creek	S. C.	29,033 8	29,127	29,265	29,079	29,142	29,203	29,004	29,024	29,115	29,097	29,154	29,029	29,190	29,027
Kalamazoo*	S. C.	29,033 19	29,037	29,173	29,030	29,063	29,124	29,926	29,940	29,038	29,025	29,045	29,941	29,093	29,022
Marshall	S. C.	29,034 6	29,051	29,175	29,033	29,073	29,138	29,949	29,968	29,047	29,047	29,056	29,950	29,115	29,048
Hirmingham	S. E.	29,112 2	29,134	29,248	e 29,111	29,162	29,217	a 29,042	a 29,045	e 29,138	b 29,129	e 29,146	e 29,027	e 29,224	e 29,120
Detroit*	S. E.	29,320 16	29,348	29,471	29,327	29,363	29,425	29,244	29,252	29,346	29,322	29,364	29,267	29,422	29,351

\* For stations marked thus \* a correction has been made for instrumental error, as follows: For Alpena, .006 added; for Grand Haven, .013 added; for Port Huron, .009 added; for Detroit, .017 added; for Agricultural College, .010 subtracted; for Jan., Feb. and March, for other stations the instrumental error of barometer is not known.

† At the stations of the U. S. Signal Service, for the first six months of the year 1888, the observations were made at 7 A. M., 3 P. M., and 10 P. M., 75th meridian time; and for the last six months at 8 A. M., and 8 P. M., 75th meridian time. The corresponding local time for each of these stations is stated in the star (\*) footnote to Table I., page 11.

‡ The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit I., page 2.

§ The full names of divisions, and the counties in each division, are stated in Exhibit J. in a paper which follows on weekly reports of sickness.

|| Numbers in this column state the average annual atmospheric pressure for a period of years ending in each case with Dec. 31, 1888. The small figures at the right of the numbers which state the number of years included in the average.

¶ This line is an average for 12 stations, at which observations were made tri-daily, and from which reports, nearly complete, were received for every month in this year. It does not include the U. S. Signal Service Stations. Green's standard barometer was used at all the 17 stations except for the first three months at Kalamazoo for 1888. The barometer used at Kalamazoo for Jan., Feb. and March was manufactured by J. Foster, Cincinnati, Ohio.

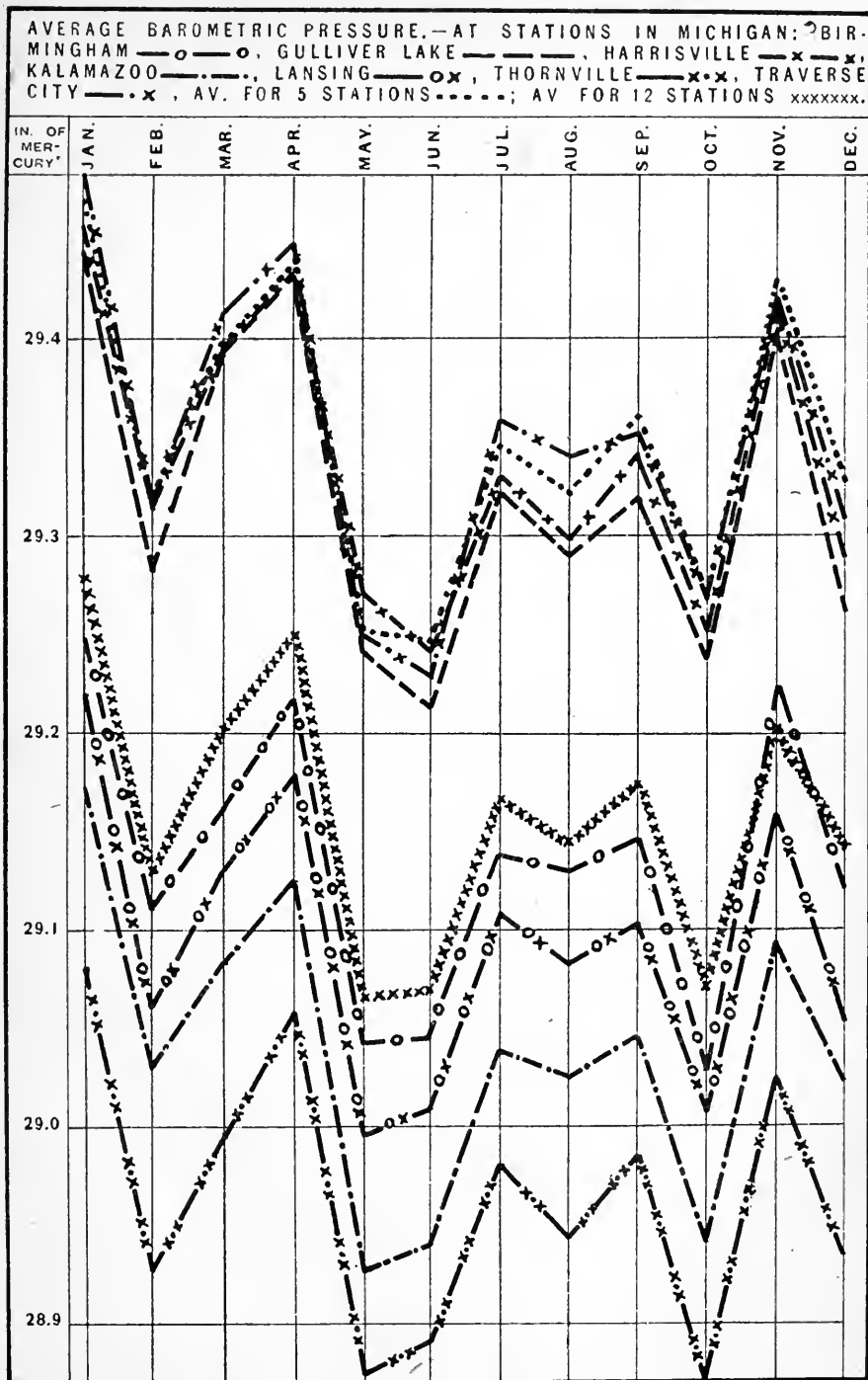
\*\* This is an average line for the five U. S. Signal Service Stations.

\*\*\* Computations of monthly averages for the year 1888 were furnished by the observers at Alpena, Grand Haven, Port Huron, Detroit and Ann Arbor. The remainder of the computations were made at the office of the State Board of Health.

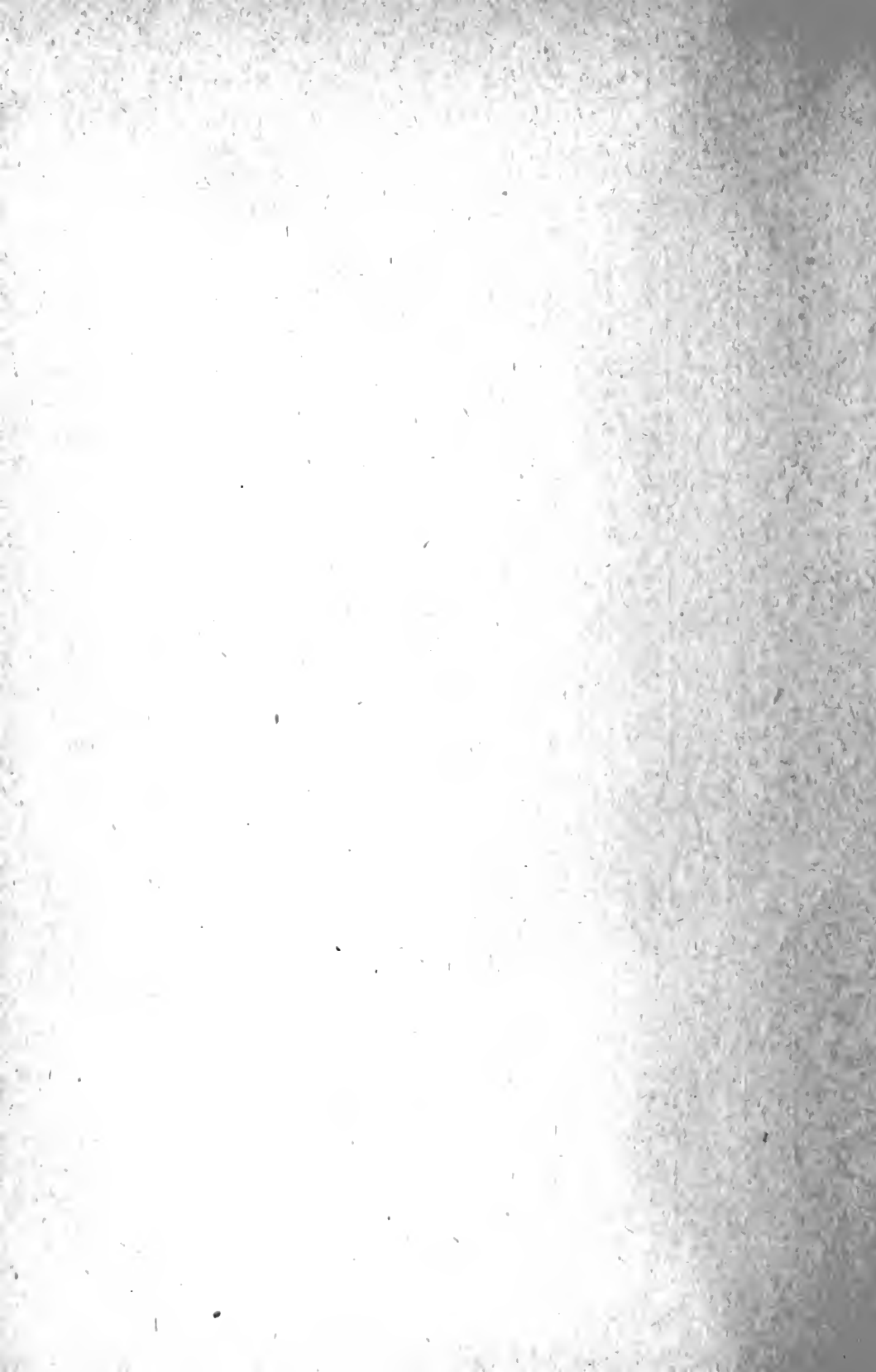
a For 30 days. b For 20 days. c For 25 days. d For 22 days. e For 21 days. f For 22 days. g For 21 days.

The lines for 7 stations in this table are graphically represented in Diagram XV., page 77.

DIAGRAM XV.—ATMOSPHERIC PRESSURE, BY MONTHS, IN 1888.



\*SCALE, ONE TENTH INCH OF MERCURY TO 1.04 IN. VERTICALLY.





# THE TIME OF GREATEST PREVALENCE OF EACH DISEASE.

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## CONTRIBUTIONS TO THE STUDY OF THE CAUSES OF SICKNESS.

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A STATISTICAL REPORT BASED ON WEEKLY REPORTS OF SICKNESS IN  
MICHIGAN DURING THE YEAR 1888, AND PRECEDING YEARS.

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BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

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This paper is the twelfth in a series of articles upon the same general subject, begun in the latter part of 1876. It presents a summary of the compilation of weekly reports of sickness in Michigan in 1888. It includes a series of diagrams or graphic illustrations which show by months in 1888, the rise and fall of twenty-eight of the most prominent diseases in Michigan.

Propositions are stated as to the relations of specified meteorological conditions, and diseases are mentioned under these propositions in such manner as to suggest one method of studying some of the facts brought out in the compilation.

Tables are given showing the per cent of the weekly *reports* which stated the presence of the various diseases, first (in Exhibit IV.), for each of the years 1877-1888, and an average for 1877-1887; and secondly (in Exhibit IV. continued), by months, in the year 1888, in each of the years 1886-7, and the average for the period of years 1877-87, the diseases being arranged in the order of their greatest reported prevalence in 1888, to facilitate a comparison with the prevalence of the same diseases in previous years, and in corresponding months in previous years.

The per cent of *observers* stating the presence of each of the diseases is given in Table 1, for the year 1888, and, for comparison, for each of the years 1877-1887, and, in Table 1 continued, for the months in the year 1888, and, for comparison, by months in each of the years 1886-7, and the average by months for the period 1877-87.

Comparing Table 1, with Exhibit IV., we see the correspondence in the two lines of evidence,—that of the “prevalence” of the diseases as shown by the per cent of *reports*, and the “area of prevalence” as shown by the per cent of *observers*, the diseases following each other in a somewhat similar order from highest to lowest—the diseases being arranged in the table, as in the exhibit, in the order of their greatest reported prevalence in 1888.

One of the objects of this compilation is to learn the time of the greatest and of the least prevalence of the more important diseases in the State, and to note the connection of this prevalence with each of the meteorological conditions in the State. Casual observation shows that certain diseases are much more prevalent in the hot months, while certain other diseases are

much more prevalent in the cold months. The relation between these diseases and the atmospheric temperature is well marked, but accurate statistics are needed to show just what that relation is. We find, also, that other meteorological conditions than atmospheric temperature have a marked effect upon many of the diseases, apparently diminishing the effect of temperature in some instances, increasing its effect in other instances. For this reason the State Board of Health undertakes by a compilation of the weekly reports of sickness in connection with the various meteorological conditions, to learn what causal relations exist between the humidity of the air, the ozone, the velocity of the wind, the atmospheric pressure, etc., and the increased or diminished prevalence of diseases in certain months as compared with other months in the same year, or with the same months in other years or series of years.

Since 1876, when this system of "weekly reports of sickness" was begun, an important work has been accomplished in learning the time of the greatest prevalence of each of several of the most important diseases, and consequently the time of greatest danger from each such disease in the State considered as a unit. To facilitate the study of the causes of sickness and deaths, the State is divided into eleven geographical divisions, a list of which, and the counties embraced in each, appear in Exhibit I., page 85. From some of these divisions sufficient data are not yet received to make the study of the comparative prevalence of diseases in different parts of the State practicable. The number of reports from localities in the newer parts of the State is increasing, however, and a comparison of sickness by localities may become practicable in the near future.

#### PHYSICIANS' WEEKLY REPORTS OF SICKNESS.

Weekly reports are now received concerning twenty-eight diseases, the names of which are printed on the blank postal used for the weekly report, and concerning these twenty-eight diseases a positive report is made each week by many of the leading physicians in Michigan.

Great credit is due the busy medical practitioners in Michigan who forward these reports of sickness. Some of them have made the reports regularly since this plan was adopted in 1876. The service is, as a rule, without compensation; possibly a few health officers may have slight pay from their local boards of health. No other class of persons, however, has knowledge of the facts that are necessary in the compilation of health statistics; and it is greatly to the credit of physicians that they are so willing to coöperate in every effort made to advance the public health.

#### PLAN OF THE WEEKLY CARD-REPORTS.

The plan of the weekly reports remains the same as last year. (Cards having *Pleuritis* printed on them were first used for weekly reports in October, 1887.) Observers now report only the diseases under their own personal observation. Previous to the year 1885, some of the observers reported such diseases as they believed to be present in their locality, even though not under their own observation. The change in method of making the reports may account partially for the apparent decrease in sickness in 1888, when compared with the average for the eleven years, 1877-87. Details of the method of securing and the plan of marking these reports may be thus stated:—

The blanks for the weekly reports are printed on postal cards, which are supplied to the observers of diseases. Blank record books in which to preserve copies of the reports, remarks, etc., are also supplied to these observers, to be retained by them. The reports are forwarded weekly to the Secretary of the State Board of Health, at Lansing.

The plan of making the report is as follows: Each observer is requested to mark the disease of which there was the greatest number of cases under his observation during the week for which the report is made, 1; that of which there was the next greatest number of cases, 2; the next, 3; and so on, applying *consecutive* numbers to the diseases reported present; but marking with the *same* figure all diseases of which there is the same number of cases; to write 0 opposite each disease mentioned of which there was no case; to apply these numbers without regard to the severity of the cases; to include all cases, without regard to when they were taken sick, so long as they are actually sick with the given disease; to include all cases "under the observation" of the observer. A blank is left on the card for the convenience of those observers who prefer to state the number of cases rather than the order of prevalence by the foregoing method.

To illustrate the method of making the reports, the following copy of one of the blanks now in use is given, correctly marked, in the "prevalence" column, for the number of cases stated on the right-hand margin. It should be remembered that the numbers in the "prevalence" column denote simply the relative order in which the several diseases appear to be prevalent, and do not denote a definite number of cases; so that a disease might one week be marked 4, and the following week, with the same number of cases, be marked 7. Names of diseases and figures printed in italics are not *printed* on the postal blanks, but are supposed to have been *written* on the report by the observer.

Diseases in ..... [and vicinity?]

PLEASE DATE.

week ending Sat. ...., 188...

Ed. 27.		Prevalence. Order. Seca.	Cases.
	Brain, Inflammation of.....	14	1
	Bowels, Inflammation of....	12	3
	Bronchitis.....	11	4
	Cerebro-spinal Meningitis..	0	0
	Cholera Infantum.....	8	9
	Cholera Morbus.....	10	6
	Consumption, Pulmonary..	10	6
	Croup, Membranous.....	12	3
	Diphtheria.....	5	14
	Diarrhea.....	3	17
	Dysentery.....	8	9
	Erysipelas.....	13	2
	Fever, Intermittent.....	2	21
	Fever, Remittent.....	11	4
	Fever, Typhoid (Enteric)...	0	0
	Fever, Typho-malarial.....	9	7
	Influenza.....	7	11
	Kidney, Inflammation of....	14	1
	Measles.....	1	27
	Neuralgia.....	14	1
	Pleuritis.....	0	0
	pneumonia.....	9	7
	Puerperal Fever.....	0	0
	Rheumatism.....	6	12
	Scarlatina.....	4	16
	Small-pox.....	0	0
	Tonsillitis.....	11	4
	Whooping-cough.....	0	0
	Mumps.....	6	12
	Dyspepsia.....	11	4

a. Please mark the disease of which there is the greatest number of cases, 1; the disease having next greatest number of cases, 2; the disease having the next greatest number of cases, 3; and so on, applying consecutive numbers to the diseases reported present; but marking with the same figure all diseases of which there is the same number of cases; to write 0 opposite each disease of which there is no case under your observation. [For full statement of plan, see second, third, and fourth pages of record-book cover.] A blank indicates that the item has been overlooked.

Please mail this,  signed and dated,  as soon as convenient after close of week specified.

This report is of diseases UNDER YOUR OBSERVATION; if it includes a contagious disease, please mention, on the bottom or margin of this card, the township, city, or village in which the disease is.



, M. D.

## BULLETINS OF HEALTH IN MICHIGAN.

During the year 1888 the issue of weekly and monthly bulletins of "Health in Michigan" has been continued. The weekly bulletin is compiled from the physicians' weekly reports from all parts of the State. It is designed to give, each week, information to the public concerning the diseases which cause most sickness in the State, the relative amount of sickness compared with the corresponding week in previous years, and compared with the preceding week—thus showing any sudden increase or decrease which may have occurred in the prevalence of any disease, together with a similar comparison of the various meteorological conditions; also, a list of the localities in which each of the dangerous communicable diseases is reported present. A copy of this bulletin has been sent to such editors as have expressed a desire to have it for use, entire or in part, in their papers. About thirty-five copies are now used for this purpose each week. An abstract of it also goes to the Michigan Associated Press. The monthly bulletin is similar in character to the weekly bulletin. It is issued as soon as possible after the close of each month, and it is sent to the sanitary and medical journals which are received as exchanges by the library of the State Board of Health. About eighty copies are thus used at the present time.

As a rule, about three-fourths of the card reports reach the office of the State Board of Health in time for compilation in the weekly bulletin, and the monthly bulletins are compiled from the information used in the weekly bulletin. It is found that the statements made in the monthly bulletins are corroborated by the information obtained after the close of the year, in the compilation of the whole number of the reports for the corresponding months of the year.

## COMPILATION OF THE WEEKLY REPORTS.

The reports from each locality are compiled by months. The average of the numbers stating the order of prevalence of the several diseases for the month is considered an indication of the actual order of prevalence of the diseases for that time. There is also found for each locality what per cent of the reports state the presence of each disease for the given month. This per cent of reports for a single locality indicates what part of the month the disease was present in that locality. It may also be called the per cent of weeks the disease was present. These first results of the compilation are stated in Table 3, which, on account of the space required, has not been printed in the Reports since that of 1882, but is preserved in the office of the State Board for reference and study.

A combination of the statements for localities in Table 3, is made by months for the State, so far as it is represented by the localities from which reports are received showing: (1) What per cent of the observers reported each disease each month; (2) for the localities at which a given disease was reported, an average of the per cent of weeks it was reported at those localities; (3) what per cent of all the reports received for the month stated the presence of each disease; (4) an average of the numbers denoting the order of prevalence of each disease at the localities at which it was reported present during the month.

## THE PREVALENCE OF THE SEVERAL DISEASES IN 1888.

By noting the per cent of all the reports received for a given time which stated the presence of each disease, the relative prevalence of the several diseases may be readily seen. This per cent has been computed for each disease, by months, for the year 1888. It is thus stated in Exhibit II., page 86, which also states the per cent for each disease for the year 1888, and an average for the period of eleven years, 1877-87. What per cent of the reports stated the presence of each disease by months in 1888, is graphically represented in Diagrams 1-5, on page 87, and following pages.

For eighteen diseases a comparison has been made of the amount of sickness in 1888 (as indicated by the proportion of reports stating the presence of the disease) with the average amount for a period of eleven years. These comparisons are shown in Exhibits XI., XIII., XVIII., and XX. A comparison is made in Table 1, pages 95-7, between the per cent of observers reporting the tabulated diseases present in each of the years 1877-1888, and by months in three of those years; also an average by months for the period of eleven years, 1877-87. In Exhibit IV., on pages 90 and 91, the per cent of reports stating the presence of each of the twenty-eight tabulated diseases, by months, for each of the years 1886-8, and an average by months for the period of eleven years, 1877-87, is given. In Table 1, and in Exhibit IV., the diseases are arranged in the order of the greatest per cents for 1888, the highest being placed first.

A study of the reported sickness from twenty-eight diseases, in connection with meteorological conditions by months in 1888, is made in Exhibit X., and following exhibits. By arranging months in order of greatest prevalence of the disease under consideration, noting whether it is more or less prevalent than the average for the year, and noting what were the meteorological conditions for the same months as compared with the average for the year, relations and comparisons are grouped for convenient comparison. A summary of one line of the evidence presented by these exhibits is given in Exhibits XXIV. and XXV.

In Exhibits VI. and VII., on pages 111 and 112-13, the leading diseases are arranged in order according to the amount of sickness reported from them in 1888, those from which there was most sickness reported being placed first. In these exhibits the diseases are arranged with reference to the per cent of reports taken in connection with the average order of prevalence.

The comparison with former years is facilitated by reference to Exhibit II., page 86, Table 1, pages 95, 96 and 97, Exhibit IV., pages 89, 90 and 91, and Exhibits XI., XIII., XVIII., and XX.

Exhibit IV., on pages 89, 90 and 91, is continued for 1888. In it the diseases are arranged in order of the greatest per cent of reports stating the presence of the diseases in 1888, the highest per cent being placed first in the line. It is similar in form to Table 1, page 95, which shows the per cent of observers by whom diseases were reported present. It affords a means of comparing the diseases showing greatest prevalence with those showing greatest area of prevalence or widest distribution. It affords also a means for the comparison of per cent of reports in 1888, with the average per cent of reports in the eleven years, 1877-1887, both for the year and by months, also by months in 1888 with several of the years previous to 1888.

DISEASES FROM WHICH THERE WAS A MARKED INCREASE OR DECREASE IN  
PREVALENCE IN MICHIGAN IN 1888.

By referring to Exhibits II. and IV., it will be seen that there was no disease which showed a marked increase in 1888 over the average for the eleven years, 1877-87.

*Change in Method of Comparison of Diseases by Years.*

In former Reports mention has been made of diseases in which a difference of seven or more was shown between the per cents of reports stating the presence of the disease in the current year and in the preceding year or term of years; now those diseases are mentioned of which the comparison shows an increase or decrease of twenty-five per cent from the preceding year, or from the normal, as the case may be.

The diseases in which the decrease in 1888 appears most marked are small-pox, diphtheria, whooping-cough, scarlet fever, intermittent fever, membranous-croup, typho-malarial fever, remittent fever and cerebro-spinal meningitis.

In Exhibits XI., XIII., XVIII., and XX., the per cent of reports by months in 1888 is placed directly under the per cents for the corresponding months in 1887. A comparison between the corresponding months in the two years is thus made possible, and the comparison of the months in 1888 with the averages for the months in the series of years preceding is made possible by placing the differences, greater or less, in separate lines. But in order to make a proper comparison, the increase or decrease by per cent of difference from the preceding year or series of years should be computed.

A part of the lessened prevalence of some of the prominent diseases may be due to the change in the method of reporting sickness, referred to in the last paragraph on page 80.

EXHIBIT I.—*Eleven Geographical Divisions of the State, formed for the purpose of facilitating the study of Causes of Sickness and of Deaths, with a list of Counties included in each Division.*

1.—Upper Peninsular.	2.—Northwest- ern.	3.—Northern.	4.—Northeastern.	5.—Western.	6.—Northern Central.	7.—Bay and Eastern.	8.—Central.	9.—South- western.	10.—Southern- Central.	11.—South- eastern.
Alger.	Benzie.	Antrim.	Alcona.	Kent.	Clare.	Arenac.	Barry.	Allegan.	Branch.	Macomb.
Baraga.	Gr. Traverse.	Charlevoix.	Alpena.	Lake.	Gladwin.	Bay.	Clinton.	Berrien.	Calhoun.	Monroe.
Chippewa.	Leelanaw.	Cheboygan.	Iosco.	Nason.	Isabella.	Huron.	Eaton.	Cass.	Hillsdale.	Oakland.
Delta.	Manistee.	Crawford.	Montmorency.	Muskegon.	Mecosta.	Lapeer.	Genesee.	Van Buren.	Jackson.	Wayne.
Gogebic.	Manitou.	Emmet.	Ogemaw.	Newaygo.	Midland.	Saginaw.	Gratiot.		Kalamazoo.	
Houghton.	Wexford.	Kalkaska.	Oscoda.	Oceana.	Roscommon.	Sanilac.	Ingham.		Lenawee.	
Iron.		Otsego.	Presque Isle.	Ottawa.	Missaukee.	St. Clair.	Ionla.		St. Joseph.	
Isle Royal.					Oscoda.	Tuscola.	Livingston.		Washtenaw.	
Keweenaw.							Montcalm.			
Luce.							Shiawassee.			
Mackinac.										
Marquette.										
Menominee.										
Ontonagon.										
Schoolcraft.										

On pages 230 and 253 of the Report of this Board for 1885, the divisions and the counties in each were indicated by lines on maps of the State. Similar maps appear in the articles on diphtheria and scarlet fever near the end of the present Report.

EXHIBIT II.—*Stating for each of 28 Diseases for the Year ending Saturday, December 29, 1888, by Months of the Year 1888, and the average for the period of eleven years, 1877-1887, on what Per Cent of the reports received each Disease was stated to be present.—Compiled from weekly reports by Health Officers of Cities and Villages, by Regular Correspondents of the State Board of Health, and by other physicians.\**

Diseases.	Average, 1877-87.	What Per Cent of the Reports received stated the Presence of the Disease.												
		Year, 1888.	Months, 1888.											
			Jan.	Feb.	Mar.	Apr	May.	June.	July.	Aug	Sept.	Oct.	Nov.	Dec.
Average † .....	29	24	24	26	27	26	24	23	22	25	25	23	22	23
Brain, Inflammation of..	6	5	6	6	6	6	4	5	5	5	6	5	7	5
Bowels, Inflammation of.	15	14	18	13	17	15	15	13	17	16	14	12	12	13
Bronchitis.....	61	59	63	76	74	68	63	55	41	39	49	59	59	65
Cerebrospinal Meningitis	4	3	2	3	4	4	2	3	2	2	2	3	3	2
Cholera Infantum .....	13	11	1	0.7	2	2	3	9	23	40	29	7	2	3
Cholera Morbus.....	19	15	4	2	4	4	6	15	33	48	34	11	7	4
Consumption, Pulmonary	63	49	50	51	52	47	53	56	51	49	44	43	44	48
Croup, Membranous.....	6	4	7	5	6	7	5	3	0.5	0.8	1	4	3	5
Diphtheria .....	21	7	9	10	7	8	7	5	5	6	7	7	5	6
Diarrhea .....	47	41	23	26	31	29	30	35	60	78	73	37	31	25
Dysentery.....	19	17	6	6	6	6	7	8	25	51	43	15	9	4
Erysipelas.....	23	24	26	28	26	30	27	27	19	20	17	22	23	30
Fever, Intermittent.....	70	45	40	41	45	45	46	44	47	46	48	48	43	38
Fever, Remittent.....	47	34	31	35	32	31	33	30	28	41	47	39	33	30
Fever, Typhoid (Enteric).	12	10	10	7	6	5	4	5	7	12	18	16	12	10
Fever, Typho-malarial...	21	15	11	10	8	11	10	11	7	16	26	31	24	15
Influenza .....	39	32	43	56	53	41	32	24	13	12	19	28	31	40
Kidney, Inflammation of	21	19	22	20	23	24	22	20	15	16	14	15	18	21
Measles.....	13	16	16	25	28	35	37	30	10	3	3	4	2	3
Neuralgia.....	66	62	66	68	71	66	62	56	57	58	51	62	64	62
Pleuritis .....	18	24	32	29	23	18	14	8	8	9	15	16	22	
Pneumonia.....	36	30	42	51	54	44	40	24	13	10	15	17	24	33
Puerperal Fever.....	5	4	5	5	8	4	5	3	4	3	4	4	3	3
Rheumatism .....	69	66	66	73	74	70	70	69	58	53	61	70	68	69
Scarlatina.....	17	9	15	11	9	14	11	9	6	4	6	9	9	13
Small-pox.....	1	.03	0.6	1	0.3	0	0.2	0	0	0	0	0	0.5	1
Tonsillitis.....	48	41	55	55	60	50	41	32	24	21	27	35	49	49
Whooping-cough.....	20	9	9	11	11	11	11	9	8	7	9	8	8	12
No. of reports received...	4,236	5047	358	430	375	361	483	383	400	523	414	500	405	415

\* For 1888 the names of observers are stated in Exhibit V., pages 92, 93 and 94.

† This line is an average for such of the tabulated diseases as were reported present in the given month or year.

Statements in this exhibit for months in 1888 are graphically represented in Diagrams 1, 2, 3, 4, 5, opposite this page and on following pages.



DIAGRAM I - WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1888.

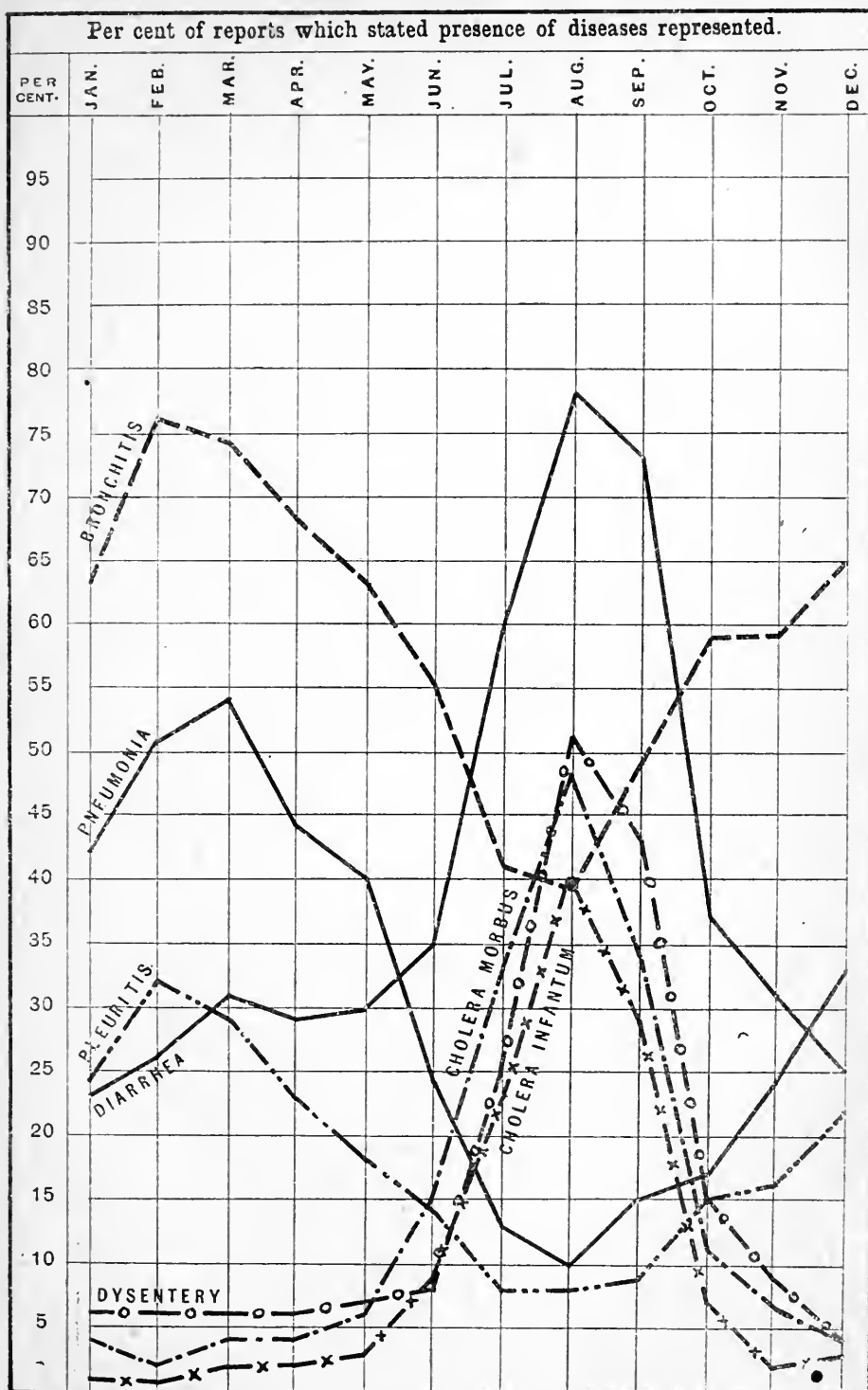


EXHIBIT III.—*Slating, by Months of the Year ending Saturday, December 29, 1888, for the State, and for each of the Eleven Geographical Divisions of Michigan, from which Weekly Reports of Diseases were received, the Number of Observers from whom the Reports were received, the Number of Reports received, the day on which, for the purposes of this compilation, each month is made to end, and the Number of Weeks thus included in each month.*

Months, 1888.	Months and Year End Saturday.	Number of Weeks.	State.		Divisions of the State.*																					
					1. Upper Peninsula.*		2. North-western.*		3. North-eastern.*		4. North-eastern.*		5. West-ern.*		6. Northern Central.*		7. Bay and Eastern.*		8. Cen-tral.*		9. South-western.*		10. Southern Central.*		11. South-eastern.*	
			Observers.†	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†
Year, 1888.....	Dec. 29, 1888.....	52	142	5,047	8	244	4	143	6	138	5	189	10	342	6	187	22	823	28	864	13	417	25	1,013	15	654
Av. per month.....	.....	.....	102	421	5	20	3	12	3	12	4	16	7	29	4	16	17	69	18	72	9	37	20	84	13	55
January.....	Jan. 28.....	4	91	358	4	16	2	8	3	10	3	12	6	24	3	12	16	61	14	56	8	32	18	71	14	56
February.....	March 3.....	5	87	430	3	15	2	10	1	4	3	15	5	25	3	15	15	73	14	70	8	38	19	95	14	70
March.....	March 31.....	4	98	375	8	26	3	11	0	0	3	12	8	30	4	14	17	65	15	59	8	32	19	74	13	52
April.....	April 28.....	4	96	361	8	28	3	10	1	4	4	16	7	27	3	12	16	58	13	48	7	28	20	76	14	54
May.....	June 2.....	5	102	483	5	22	3	15	3	14	5	24	6	29	4	20	20	90	15	70	9	41	20	98	12	60
June.....	June 30.....	4	100	383	5	20	3	12	3	10	4	16	7	26	4	12	17	65	16	61	9	35	20	78	12	48
July.....	July 28.....	4	109	400	5	19	3	12	4	15	4	16	8	30	5	16	17	60	21	76	8	31	21	76	13	49
August.....	Sept. 1.....	5	110	523	5	24	3	14	4	20	4	20	7	32	4	16	19	87	20	96	9	44	22	108	13	62
September.....	Sept. 29.....	4	109	414	4	15	3	12	4	16	3	12	7	28	4	14	18	64	21	78	10	37	22	87	13	51
October.....	Nov. 3.....	5	105	500	5	24	3	15	3	14	4	18	7	35	4	18	17	81	19	90	11	53	20	94	12	58
November.....	Dec. 1.....	4	105	405	4	16	3	12	4	15	3	12	7	28	5	18	17	60	20	79	10	39	20	78	12	48
December.....	Dec. 29.....	4	109	415	5	19	3	12	4	16	4	16	7	28	5	20	17	62	22	81	10	37	20	78	12	46

\* For counties in each division see Exhibit I., page 85.

† From some of the observers reports were not received for every week, so that the number of reports received does not equal the number of observers multiplied by the number of weeks in the given month or in the year.

‡ In some localities there were more observers than one. The whole number of localities from which reports were received was 122; the average number per month was 94. The names of observers and number of cards received from each observer for each month and for the year are stated in Exhibit V., pages 92, 93, 94.

EXHIBIT IV.—*Stating for each of 28 Diseases for the period of Eleven Years ending Saturday, December 31, 1887, and for each of those Years and 1888, on what Per Cent of the Reports received the Diseases were stated to be Present Compiled from Weekly Reports by Health Officers of Cities and Villages and by regular Correspondents of the State Board of Health.\* (Continued for each month of several of the above mentioned years on pages 90 and 91.)*

Line Number.	Diseases.	What per cent of the Reports stated the Presence of the Disease.												
		Average 1877-87.	1888.	1887.	1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.
	Average Disease†	29	24	25	26	26	29	30	30	33	32	33	30	28
1	Rheumatism.....	69	66	69	70	68	70	68	68	71	71	72	68	60
2	Neuralgia.....	66	62	67	67	68	70	69	68	65	64	59	-----	-----
3	Bronchitis.....	61	59	55	56	56	61	66	65	62	64	64	64	55
4	Consumption, Pul.‡	63	49	51	55	58	63	61	66	71	68	70	71	-----
5	Intermittent Fever..	70	45	48	51	59	65	69	71	82	82	82	82	75
6	Tonsillitis‡	48	41	47	49	50	50	50	48	48	49	45	-----	-----
7	Diarrhea.....	47	41	48	45	46	52	49	43	52	47	48	41	41
8	Remittent Fever‡	47	34	32	34	36	44	41	48	54	56	57	58	52
9	Influenza.....	39	32	33	35	34	41	43	40	35	42	45	44	41
10	Pneumonia.....	36	30	28	27	27	29	38	39	41	42	41	41	40
11	Erysipelas.....	23	24	24	23	24	26	25	22	23	25	25	21	20
12	Inflam. of Kidney†	21	19	18	20	21	26	-----	-----	-----	-----	-----	-----	-----
13	Pleuritis.....	-----	18	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
14	Dysentery.....	19	17	19	17	15	23	21	17	23	18	18	19	21
15	Measles.....	13	16	14	6	5	10	24	11	26	19	12	5	7
16	Cholera Morbus.....	19	15	19	17	17	22	18	17	26	20	19	14	15
17	Typho-Mal. Fever‡	21	15	16	16	16	20	18	24	29	24	22	24	26
18	Inflam. of Bowels‡	15	14	16	17	17	17	16	13	14	12	-----	-----	-----
19	Cholera Infantum...	13	11	13	14	11	15	14	12	18	14	14	11	11
20	Typhoid Fev. (Ent.).	12	10	10	8	8	12	11	14	18	14	12	10	14
21	Scarlet Fever.....	17	9	8	11	12	16	19	18	19	15	23	25	21
22	Whooping-cough....	20	9	14	20	14	23	15	17	16	32	23	21	21
23	Diphtheria.....	21	7	10	13	14	15	17	25	34	27	29	23	19
24	Inflam. of Brain‡	6	5	6	5	6	7	6	5	5	6	-----	-----	-----
25	Puerperal Fever....	5	4	6	5	6	7	7	7	5	3	3	3	4
26	Membranous Croup.	6	4	4	5	5	6	6	7	9	6	7	7	6
27	Cerebro-Spi. Meningitis.	4	3	3	4	6	7	5	6	9	2	2	2	3
28	Small-pox.....	1	.03	.02	0.4	0.2	0.1	0.3	3	2	0.4	0.4	0.2	4
	No. of reports rec'd.	4,236	5,047	4,396	5,583	5,108	3,957	4,458	4,745	3,567	3,991	3,755	3,221	3,320

\* For 1888 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit III., page 88, the names of the observers and the number of the reports received from each are stated in Exhibit V., pages 92, 93, 94.

† The numbers opposite the names of the diseases do not state what per cent of the whole number of reports for the year stated the disease to be present at some time during the year, but state (on an average for twelve months of the year), what per cent of reports for the several months stated the disease to be present in those months. The column for each year is thus a statement for an average month of that year. On the two following pages of this table, however, the columns for each month state what per cent of the reports for that month (the number of which is stated at the foot of the column) stated the given disease to be present in that month.

[‡ For foot-note see page 94.]

EXHIBIT IV.—CONTINUED.—*Stating for each of 28 Diseases by Months, on what Per, also the Average by Months for the*

What Per Cent of the Reports Received Stated Presence of the Disease.†																											
January.*							February.*							March.*													
Line Number.	Diseases.	Av. 77-'87.	1888.	1887.	1886.		Line Number.	Diseases.	Av. 77-'87.	1888.	1887.	1886.		Line Number.	Diseases.	Av. 77-'87.	1888.	1887.	1886.		Line Number.	Diseases.	Av. 77-'87.	1888.	1887.	1886.	
	Average Disease.†	30	24	26	26			Average Disease.†	30	26	27	26			Average Disease.†	31	27	28	28								
1	Neuralgia.....	69	66	72	69		1	Bronchitis.....	76	76	69	69		1	Bronchitis.....	76	74	67	71								
2	Rheumatism.....	73	66	76	68		2	Rheumatism.....	73	73	74	71		2	Rheumatism.....	75	74	77	78								
3	Bronchitis.....	76	63	67	71		3	Neuralgia.....	71	68	73	69		3	Neuralgia.....	73	71	76	74								
4	Tonsillitis.....	60	55	56	62		4	Influenza.....	60	56	52	51		4	Tonsillitis.....	60	60	61	63								
5	Consumpt'n, Pul.	63	50	53	61		5	Tonsillitis.....	61	55	59	63		5	Pneumonia.....	60	54	50	52								
6	Influenza.....	55	43	47	44		6	Pneumonia.....	62	51	51	46		6	Influenza.....	59	53	50	52								
7	Pneumonia.....	57	42	43	37		7	Consumpt'n, Pul.	55	51	54	58		7	Consumpt'n, Pul.	66	52	61	60								
8	Intermittent Fev.	57	40	39	47		8	Intermittent Fev.	59	41	42	49		8	Intermittent Fev.	62	45	48	50								
9	Remittent Fev.....	39	31	29	33		9	Remittent Fev.....	38	35	26	29		9	Remittent Fev.....	40	32	27	34								
10	Erysipelas.....	26	26	23	25		10	Pleuritis.....	32	32	28	25		10	Diarrhea.....	29	31	31	25								
11	Pleuritis.....	24	24	24	24		11	Erysipelas.....	24	28	28	25		11	Pleuritis.....	16	29	22	22								
12	Diarrhea.....	24	23	28	27		12	Diarrhea.....	28	26	32	31		12	Measles.....	16	28	22	22								
13	Inflam. of Kidney.	24	22	22	21		13	Measles.....	13	25	17	5		13	Erysipelas.....	28	26	32	26								
14	Inflam. of Bowels.	14	18	16	16		14	Inflam. of Kidney.	25	20	22	19		14	Inflam. of Kidney.	24	23	23	21								
15	Measles.....	10	16	11	4		15	Inflam. of Bowels.	13	13	16	15		15	Inflam. of Bowels.	15	17	17	15								
16	Scarlet Fever.....	21	15	11	11		16	Scarlet Fever.....	22	11	11	12		16	Whooping-cough.	19	11	15	17								
17	Typho-mal. Fev.	17	11	10	10		17	Whooping-cough.	20	11	15	17		17	Scarlet Fever.....	23	9	12	17								
18	Typhoid Fev. (En.)	11	10	6	6		18	Diphtheria.....	23	10	11	14		18	Puerperal Fev.....	7	8	7	6								
19	Diphtheria.....	26	9	13	18		19	Typho-mal. Fev.	15	10	12	9		19	Typho-mal. Fev.	13	8	11	12								
20	Whooping-cough.	20	9	12	16		20	Typhoid Fev. (ent.)	9	7	10	9		20	Diphtheria.....	20	7	11	11								
21	Croup, Membr.....	11	7	10	7		21	Inflam. of Brain.	6	6	9	5		21	Croup, Membran.....	8	6	4	4								
22	Inflam. of Brain.	6	6	9	7		22	Dysentery.....	7	6	8	8		22	Dysentery.....	8	6	10	7								
23	Dysentery.....	7	6	9	7		23	Puerperal Fev.....	5	5	5	5		23	Inflam. of Brain.	6	6	6	6								
24	Puerperal Fev.....	5	5	5	5		24	Croup, Membran.....	5	5	6	6		24	Typhoid Fev. (ent.)	6	6	4	4								
25	Cholera Morbus.....	4	4	4	3		25	Cer.-spinal Men.....	5	3	3	4		25	Cholera Morbus.....	6	4	3	3								
26	Cer.-spinal Men.....	4	2	2	4		26	Cholera Morbus.....	5	2	3	3		26	Cer.-spinal Men.....	6	4	2	7								
27	Cholera Infantum.....	2	2	1	3		27	Small-pox.....	1.1	1	0	0		27	Cholera Infantum.....	2	2	2	2								
28	Small-pox.....	1.5	0.6	0	0		28	Cholera Infantum.....	0.7	3	3	1		28	Small-pox.....	0.9	0.3	0	0								
Reports received. \$ 358 358 393 448							Reports received. \$ 326 450 379 465							Reports received. \$ 354 375 424 530													
April.*							May.*							June.*													
Line Number.	Diseases.	Av. 77-'87.	1888.	1887.	1886.		Line Number.	Diseases.	Av. 77-'87.	1888.	1887.	1886.		Line Number.	Diseases.	Av. 77-'87.	1888.	1887.	1886.		Line Number.	Diseases.	Av. 77-'87.	1888.	1887.	1886.	
	Average Disease.†	30	26	26	27			Average Disease.†	28	24	25	25			Average Disease.†	27	23	24	23								
1	Rheumatism.....	75	70	77	76		1	Rheumatism.....	71	70	71	74		1	Rheumatism.....	68	69	70	70								
2	Bronchitis.....	70	68	62	65		2	Bronchitis.....	60	63	57	57		2	Neuralgia.....	65	56	65	63								
3	Neuralgia.....	73	66	71	74		3	Neuralgia.....	67	62	67	71		3	Consumpt'n, Pul.	62	56	48	55								
4	Tonsillitis.....	53	50	53	51		4	Consumpt'n, Pul.	64	53	54	60		4	Bronchitis.....	52	55	49	45								
5	Consumpt'n, Pul.	68	47	61	61		5	Intermittent Fev.	76	46	52	57		5	Intermittent Fev.....	78	44	52	61								
6	Intermittent Fev.	70	45	50	61		6	Tonsillitis.....	47	41	46	44		6	Diarrhea.....	46	36	52	40								
7	Pneumonia.....	53	44	41	41		7	Pneumonia.....	39	40	34	29		7	Tonsillitis.....	41	32	37	39								
8	Influenza.....	51	41	43	54		8	Measles.....	25	37	25	11		8	Remittent Fev.....	40	30	30	36								
9	Measles.....	21	35	22	5		9	Remittent Fev.....	45	33	30	35		9	Measles.....	21	30	19	7								
10	Remittent Fev.....	43	31	30	34		10	Influenza.....	38	32	34	35		10	Erysipelas.....	24	27	23	25								
11	Erysipelas.....	28	30	29	31		11	Diarrhea.....	36	30	36	38		11	Pneumonia.....	24	24	16	19								
12	Diarrhea.....	28	29	32	31		12	Erysipelas.....	26	27	27	28		12	Influenza.....	26	24	23	26								
13	Inflam. of Kidney.	24	24	21	25		13	Inflam. of Kidney.	24	22	26	24		13	Inflam. of Kidney.....	22	20	19	19								
14	Pleuritis.....	23	23	23	23		14	Pleuritis.....	18	18	18	18		14	Cholera Morbus.....	18	15	25	12								
15	Inflam. of Bowels.	13	15	11	13		15	Inflam. of Bowels.	14	15	16	19		15	Pleuritis.....	16	14	15	18								
16	Scarlet Fever.....	21	14	10	12		16	Scarlet Fever.....	18	11	16	13		16	Inflam. of Bowels.	16	13	15	18								
17	Typho-mal. Fev.	17	11	10	10		17	Whooping-cough.	19	11	16	23		17	Typho-mal. Fev.....	12	11	7	10								
18	Whooping-cough.	12	11	13	15		18	Typho-mal. Fev.	11	10	6	11		18	Cholera Infantum.....	11	9	13	10								
19	Diphtheria.....	19	8	5	12		19	Dysentery.....	9	7	11	10		19	Whooping-cough.	19	9	15	23								
20	Croup, Membr.....	7	7	6	3		20	Diphtheria.....	16	7	6	12		20	Scarlet Fever.....	16	9	4	13								
21	Dysentery.....	8	6	8	7		21	Cholera Morbus.....	9	6	13	8		21	Dysentery.....	14	8	14	10								
22	Inflam. of Brain.	7	6	5	7		22	Croup, Membran.....	5	5	5	5		22	Inflam. of Brain.....	7	5	8	7								
23	Typhoid Fev. (ent.)	6	5	3	3		23	Puerperal Fev.....	5	5	5	5		23	Diphtheria.....	14	5	5	9								
24	Puerperal Fev.....	5	4	8	7		24	Inflam. of Brain.....	6	4	8	5		24	Typhoid Fev. (ent.)	6	5	4	4								
25	Cholera Morbus.....	6	4	4	5		25	Typhoid Fev. (ent.)	5	4	3	5		25	Puerperal Fev.....	5	3	7	5								
26	Cer.-spinal Men.....	6	4	3	7		26	Cholera Infantum.....	3	3	5	5		26	Cer.-spinal Men.....	5	3	4	2								
27	Cholera Infantum.....	2	2	1	2		27	Cer.-spinal Men.....	6	2	5	3		27	Croup, Membran.....	4	3	2	4								
28	Small-pox.....	1.6	0	0	0		28	Small-pox.....	2.1	0.2	0	0		28	Small-pox.....	1.8	0	0	0.4								
Reports received. \$ 303 361 306 368							Reports received. \$ 337 483 367 398							Reports received. \$ 353 383 515 508													

\* For 1888 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit III., page 88, the names of observers and the number of reports received from each are stated in Exhibit V., pages 92-94.

† The numbers in this line are an average, not for all diseases represented, but only for those reported present in the given month.

§ The numbers in this line state how many reports were received for the month in the given year.

*Cent of the Reports Received the Diseases were stated to be Present in the Years 1886-88; Period of Eleven Years, 1877-1887.*

What Per Cent of the Reports Received Stated Presence of the Disease.\*

July.*					August.*					September.*				
Diseases.	Av. 77-'87.	1888.	1887.	1886.	Diseases.	Av. 77-'87.	1888.	1887.	1886.	Diseases.	Av. 77-'87.	1888.	1887.	1886.
Average Disease.†	29	22	27	26	Average Disease.†	32	25	29	27	Average Disease.†	32	25	26	28
Diarrhea.....	73	60	82	60	Diarrhea.....	86	78	85	82	Diarrhea.....	80	73	71	81
Rheumatism.....	61	59	57	63	Neuralgia.....	58	58	59	60	Rheumatism.....	61	61	66	65
Neuralgia.....	60	57	62	63	Rheumatism.....	58	53	61	62	Neuralgia.....	60	51	65	61
Consumpt'n, Pul.....	69	51	48	51	Dysentery.....	54	51	55	44	Bronchitis.....	48	49	41	41
Intermittent Fev.....	79	47	53	61	Consumpt'n, Pul.....	57	49	47	52	Intermittent Fev.....	49	48	53	58
Bronchitis.....	43	41	41	40	Cholera Morbus.....	57	48	55	54	Remittent Fev.....	58	47	41	36
Cholera Morbus.....	48	33	59	41	Intermittent Fev.....	79	46	55	60	Dysentery.....	47	43	37	43
Remittent Fev.....	49	28	31	38	Remittent Fev.....	56	41	40	36	Consumpt'n, Pul.....	58	44	45	48
Dysentery.....	32	25	36	24	Cholera Infantum.....	47	40	45	47	Cholera Morbus.....	39	34	31	40
Tonsillitis.....	32	21	29	31	Bronchitis.....	41	39	38	37	Cholera Infantum.....	35	29	21	42
Cholera Infantum.....	33	23	44	29	Tonsillitis.....	32	21	31	31	Tonsillitis.....	37	27	38	39
Erysipelas.....	20	19	17	20	Erysipelas.....	19	20	18	18	Typho-mal. Fev.....	39	26	33	27
Inflam. of Bowels.....	18	17	20	20	Inflam. of Bowels.....	21	16	21	21	Influenza.....	29	19	27	21
Inflam. of Kidney.....	18	15	13	19	Inflam. of Kidney.....	18	16	12	18	Typhoid Fev. (ent.).....	20	18	22	16
Pneumonia.....	16	13	10	11	Typho-mal. Fev.....	25	16	27	18	Erysipelas.....	17	17	18	15
Influenza.....	20	13	14	14	Influenza.....	20	12	18	10	Pneumonia.....	16	15	14	12
Measles.....	14	10	15	4	Typhoid Fev. (ent.).....	13	12	14	13	Inflam. of Bowels.....	17	14	17	20
Pleuritis.....	13	8	8	8	Pneumonia.....	13	10	8	10	Inflam. of Kidney.....	17	14	14	15
Whooping-cough.....	13	8	8	23	Pleuritis.....	12	8	8	8	Pleuritis.....	21	9	11	19
Typhoid Fev. (ent.).....	16	7	7	8	Whooping-cough.....	22	7	18	26	Whooping-cough.....	21	9	11	24
Typho-mal. Fev.....	16	7	13	14	Diphtheria.....	15	6	6	10	Diphtheria.....	17	7	7	10
Scarlet Fever.....	13	6	3	7	Inflam. of Brain.....	7	5	6	6	Scarlet Fever.....	12	6	7	7
Inflam. of Brain.....	6	5	7	6	Scarlet Fever.....	11	4	4	6	Inflam. of Brain.....	6	6	5	4
Diphtheria.....	14	5	5	10	Puerperal Fev.....	5	3	7	5	Puerperal Fev.....	5	4	7	4
Puerperal Fev.....	5	4	6	4	Measles.....	7	3	6	4	Measles.....	5	3	4	4
Cer-spinal Men.....	4	2	3	4	Cer-spinal Men.....	4	2	4	2	Cer-spinal Men.....	4	2	3	2
Croup, Membran.....	2	0	5	1	Croup, Membran.....	2	0	2	3	Croup, Membran.....	4	1	2	5
Small-pox.....	1	0	0	1	Small-pox.....	0	0	0	1	Small-pox.....	0	0	0	3
Reports received. \$	367	400	412	446	Reports received. \$	385	523	507	470	Reports received. \$	365	414	382	567
October.*					November.*					December.*				
Diseases.	Av. 77-'87.	1888.	1887.	1886.	Diseases.	Av. 77-'87.	1888.	1887.	1886.	Diseases.	Av. 77-'87.	1888.	1887.	1886.
Average Disease.†	30	23	25	25	Average Disease.†	29	22	24	25	Average Disease.†	29	23	24	25
Rheumatism.....	67	70	68	69	Rheumatism.....	72	68	69	72	Rheumatism.....	73	69	70	73
Neuralgia.....	63	62	68	63	Neuralgia.....	68	64	66	67	Bronchitis.....	70	65	61	65
Bronchitis.....	54	59	57	51	Bronchitis.....	65	59	57	61	Neuralgia.....	70	62	65	73
Intermittent Fev.....	76	48	50	57	Tonsillitis.....	55	49	54	52	Tonsillitis.....	60	49	57	61
Consumpt'n, Pul.....	62	43	48	51	Consumpt'n, Pul.....	63	44	47	55	Consumpt'n, Pul.....	62	48	50	54
Remittent Fev.....	56	39	42	33	Intermittent Fev.....	67	43	42	48	Influenza.....	47	40	38	42
Diarrhea.....	55	37	46	51	Remittent Fev.....	47	33	31	34	Intermittent Fev.....	59	38	39	41
Tonsillitis.....	45	35	47	44	Diarrhea.....	36	31	34	36	Pneumonia.....	44	33	31	37
Typho-mal. Fev.....	41	31	30	25	Influenza.....	41	31	35	36	Erysipelas.....	24	30	25	20
Influenza.....	32	28	27	29	Pneumonia.....	33	24	28	22	Remittent Fev.....	41	30	31	27
Erysipelas.....	21	22	21	21	Typho-mal. Fev.....	13	24	17	24	Diarrhea.....	28	25	30	27
Pneumonia.....	21	17	17	13	Erysipelas.....	23	23	26	20	Pleuritis.....	22	22	27	12
Typhoid Fev. (ent.).....	22	16	18	16	Inflam. of Kidney.....	19	18	16	17	Inflam. of Kidney.....	22	21	17	22
Dysentery.....	24	15	18	23	Pleuritis.....	14	16	11	12	Typho-mal. Fev.....	21	15	9	15
Pleuritis.....	15	15	15	15	Inflam. of Bowels.....	14	12	11	12	Inflam. of Bowels.....	15	13	15	16
Inflam. of Kidney.....	21	15	18	18	Typhoid Fev. (ent.).....	20	12	15	13	Scarlet Fever.....	17	13	11	13
Inflam. of Bowels.....	14	12	13	17	Dysentery.....	11	9	7	12	Whooping-cough.....	18	12	9	14
Cholera Morbus.....	15	11	10	13	Scarlet Fever.....	17	9	10	9	Typhoid Fev. (ent.).....	15	10	11	10
Scarlet Fever.....	15	9	9	12	Whooping-cough.....	19	8	10	19	Diphtheria.....	26	6	12	15
Whooping-cough.....	18	8	9	20	Inflam. of Brain.....	6	7	3	4	Croup, Membran.....	10	5	6	8
Cholera Infantum.....	13	7	6	17	Cholera Morbus.....	6	7	4	6	Inflam. of Brain.....	5	5	6	6
Diphtheria.....	25	7	16	17	Diphtheria.....	28	5	19	18	Cholera Morbus.....	5	4	4	5
Inflam. of Brain.....	5	5	5	4	Croup, Membran.....	9	3	8	9	Dysentery.....	7	4	9	7
Croup, Membran.....	6	4	4	6	Puerperal Fev.....	5	3	4	3	Puerperal Fev.....	5	3	5	5
Puerperal Fev.....	5	4	3	6	Cer-spinal Men.....	3	3	3	3	Cholera Infantum.....	2	3	2	2
Measles.....	5	4	5	4	Cholera Infantum.....	4	2	3	5	Measles.....	8	3	11	7
Cer-spinal Men.....	4	3	3	4	Measles.....	6	2	9	5	Cer-spinal Men.....	4	2	2	4
Small-pox.....	0	0	0	0	Small-pox.....	0	0	0	0	Small-pox.....	0	1	0	0
Reports received. \$	370	500	376	446	Reports received. \$	353	465	474	433	Reports received. \$	366	415	361	504

\*. †. See notes with these marks on page 89.

† See footnote on page 94.

§ For this foot-note see page 90.

**EXHIBIT V.**—*By Months and by Geographical Divisions of the State, the Names of 142 Observers, whose Weekly Reports of Diseases for 1888 are Compiled in Tables 1, 2, 3 and 4, the Localities a for which they Report, and the Number of Reports received from Each Observer.*

Divisions and Localities Represented, and Physicians who Reported. (Health Officers in Italics.)	Weekly Reports in 1888—Compiled in this Article.												
Year, 1888.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
All localities.....	5,047	358	430	375	361	433	383	400	523	414	500	405	416
Upper Peninsular Division.....*	244	16	15	26	28	22	20	19	24	15	24	16	19
Alouez, Fred K. Smith, M. D.....	43	4	5	4	4	5	4	4	5	4	5	4	4
Daggett, C. Wacker, M. D.....	39	---	---	4	4	4	---	---	---	---	---	---	---
Detour, W. B. House, M. D.....	14	---	---	2	4	4	---	---	---	---	---	---	---
Ishpeming, G. G. Barnett, M. D.....	17	4	5	4	4	---	---	---	---	---	---	---	---
Ishpeming, T. A. Felch, M. D.....	15	4	5	4	4	2	---	---	---	---	---	---	---
Negaunee, M. R. Morse, M. D.....	36	---	---	2	3	3	4	3	4	4	5	4	4
Rockland, W. A. Burnham, M. D.....	47	4	---	4	5	4	4	4	5	4	5	4	4
Sault Ste. Marie, H. R. Floyd, M. D.....	33	---	---	2	3	5	4	4	5	3	4	---	3
Northwestern Division.....*	143	8	10	11	10	15	12	12	14	12	15	12	12
Fife Lake, J. D. Williams, M. D.....	41	---	---	3	4	5	4	4	4	4	5	4	4
Frankfort, I. Voorhets, M. D.....	52	4	5	4	4	5	4	4	5	4	5	4	4
Manistee, J. F. Hinks, M. D.....	15	4	5	4	2	---	---	---	---	---	---	---	---
Manistee, John Kinsley, M. D.....	35	---	---	---	---	5	4	4	5	4	5	4	4
Northern Division.....*	138	10	4	0	4	14	10	15	20	16	14	15	16
Bellaire, Jesse B. Hull, M. D.....	8	4	4	---	---	---	---	---	---	---	---	---	---
Boye City, A. J. De Lacey, M. D.....	35	---	---	---	---	5	4	4	5	4	5	4	4
Cheboygan, S. A. St. Amour, M. D.....	25	---	---	---	---	---	---	3	5	4	5	4	4
Mackinaw City, Harvey P. Smith, M. D.....	35	2	---	---	4	5	4	4	5	4	---	3	4
Petoskey, A. H. Winslow, M. D.....	4	4	---	---	---	---	---	---	---	---	---	---	---
Petoskey, W. A. S. Williams, M. D.....	31	---	---	---	---	4	2	4	5	4	4	4	4
Northeastern Division.....*	189	12	15	12	16	24	16	16	20	12	18	12	16
East Tawas, A. M. Webster, M. D.....	9	---	---	4	5	---	---	---	---	---	---	---	---
Harrisville, D. W. Mitchell, M. D.....	52	4	5	4	4	5	4	4	5	4	5	4	4
Long Rapids, H. H. Stoner, M. D.....	52	4	5	4	4	5	4	4	5	4	5	4	4
Oscoda, J. V. White, M. D.....	28	---	---	---	---	4	4	4	5	---	3	4	4
West Branch, C. F. Cochran, M. D.....	48	4	5	4	4	5	4	4	5	4	5	---	4
Western Division.....*	342	24	25	30	27	29	26	30	32	28	35	28	28
Berlin, A. E. Shimmel, M. D.....	43	---	---	4	4	5	4	4	5	4	5	4	4
Cedar Springs, C. S. Ford, M. D.....	41	---	---	3	4	5	3	4	5	4	5	4	4
Grand Haven, A. Vander Veen, M. D.....	16	4	5	4	3	---	---	---	---	---	---	---	---
Grand Rapids, A. Hazlewood, M. D.....	51	4	5	4	4	5	4	4	4	4	5	4	4
Hart, A. A. Dutton, Jr., M. D.....	50	4	5	4	4	5	4	4	3	4	5	4	4
Hesperia, Wm. C. Wells, M. D.....	34	---	---	---	---	4	4	4	5	4	5	4	4
Lowell, A. M. Elsworth, M. D.....	47	4	---	4	4	5	4	4	5	4	5	4	4
Ludington, G. W. Crosby, M. D.....	41	4	5	4	---	---	3	3	5	4	5	4	4
Whitehall, C. E. Walters, M. D.....	16	4	5	3	4	---	---	---	---	---	---	---	---
Whitehall, H. H. Turner, M. D.....	3	---	---	---	---	---	---	3	---	---	---	---	---
Northern Central Division.....*	187	12	15	14	12	20	12	16	16	14	18	13	20
Big Rapids, I. W. Badger, M. D.....	52	4	5	4	4	5	4	4	5	4	5	4	4
Farwell, E. B. Evans, M. D.....	11	4	5	2	---	---	---	---	---	---	---	---	---
Gladwin, T. H. Spencer, M. D.....	20	---	---	---	---	---	---	2	3	3	4	4	4
Harrison, P. E. Witherspoon, M. D.....	38	4	5	4	4	5	2	2	---	---	4	4	4
Lake City, D. J. Erwin, M. D.....	23	---	---	---	---	5	2	4	3	3	---	2	4
Rosecommon, J. H. Curnalia, M. D.....	43	---	---	4	4	5	4	4	5	4	5	4	4
Bay and Eastern Division.....*	826	61	73	65	58	90	65	60	87	64	81	60	62
Algonac, W. K. Moore, M. D.....	52	4	5	4	4	5	4	4	5	4	5	4	4
Almont, A. Price, M. D.....	46	3	5	4	3	5	3	4	4	4	5	3	3
Brown City, J. A. Watson, M. D.....	44	4	5	4	4	4	4	4	5	4	2	3	2
Capac, J. R. McGurk, M. D.....	33	4	4	4	---	---	---	---	4	4	5	4	4
Capac, C. E. Ross, M. D.....	32	---	---	---	---	4	4	4	5	4	4	4	3
Columbiaville, C. A. Wisner, M. D.....	52	4	5	4	4	5	4	4	5	4	4	4	4
Croswell, H. Carey, M. D.....	48	3	5	4	4	5	4	3	5	3	5	3	4
Dryden, I. E. Parker, M. D.....	31	4	5	2	4	5	4	2	5	---	---	---	---
East Saginaw, W. L. Dickinson, M. D.....	52	4	5	4	4	5	4	4	5	4	5	4	4
Elba, S. Phelps, M. D.....	41	---	---	4	4	4	4	4	5	4	5	4	3
Emmet, A. J. Abbott, M. D.....	14	3	---	---	---	3	2	3	3	---	---	---	---
Esserville, A. J. Harris, M. D.....	52	4	5	4	4	5	4	4	5	4	5	4	4
Fort Gratiot, O. M. Stephenson, M. D.....	20	4	5	4	2	5	---	---	---	---	---	---	---
Grindstone City, W. J. Herrington, M. D.....	25	---	---	3	2	3	---	2	5	2	4	2	2

\* In many cases the reports include sickness in the vicinity as well as the corporate limits of the places named.

\* For counties in each division see Exhibit I., page 85.

## EXHIBIT V.—CONTINUED.

Divisions and Localities Represented, and Physicians who Reported.  (Health Officers in Italics.)	Weekly Reports in 1888.—Compiled in this Article.												
	Year, 1888.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Bay and Eastern Division.—(Continued.).*													
Port Huron, C. C. Clancy, M. D.	20	4	5	4	4	3							
Port Huron, W. J. Duff, M. D.	26						4		5	4	5	4	4
Port Sanilac, R. S. Gilbert, M. D.	35					5	4	4	5	4	5	4	4
Sand Beach, H. R. Hitchcock, M. D.	48	4	5	4	4	5	4	3	3	4	5	3	4
Sand Beach, P. O. Wagener, M. D.	13					4	4	3		2			
Thornville, J. S. Caulkins, M. D.	50	4	4	4	4	5	4	4	5	3	5	4	4
Vassar, J. R. Nunn, M. D.	51	4	5	4	3	5	4	4	5	4	5	4	4
Zilwaukee, J. J. Lyon, M. D.	41	4	5	4	4	5			3	9	5	3	4
Central Division.....*	564	56	70	59	48	70	61	76	96	78	90	79	87
Dansville, T. M. Winters, M. D.	23							2	4	4	5	4	4
Durand, A. G. Cowles, M. D.	51	4	5	4	4	5	4	4	5	4	5	4	4
Eagle, H. A. Swaney, M. D.	33					3	4	4	5	4	5	4	4
Edmore, L. A. Roller, M. D.	42			3	4	5	4	4	5	4	5	4	4
Flint, A. Vander Velpen, M. D.	27					3	4	2	4	3	4	4	3
Greenville, C. M. Martin, M. D.	46	4	5	4	3	5	4	4	5	4	4	4	4
Greenville, A. W. Nichols, M. D.	26							4	5	4		4	4
Hastings, P. P. Drake, M. D.	52	4	5	4	4	5	4	4	5	4	5	4	4
Hastings, D. E. Fuller, M. D.	47	4	5	4	4	5	4	4		4	5	4	4
Howell, J. A. Wessinger, M. D.	51	4	5	4	4	5	4	4	4	4	5	4	4
Howard City, J. N. Hathaway, M. D.	23				3	5	4	4	5	2			
Howard City, James Totten, M. D.	4												4
Hubbardston, C. S. Park, M. D.	13	4	5	4									
Kalamo, L. C. Jones, M. D.	45	4	5	4	4	5	4	4	5	2		4	4
Lakeview, C. O. Adams, M. D.	24	4	5	4	3	5	3						
Lakeview, A. H. Forsyth, M. D.	23							3	5	4	5	4	2
Lansing, H. Ostrander, M. D.	13	4	5	4									
Lyons, B. M. Hutchinson, M. D.	52	4	5	4	4	5	4	4	5	4	5	4	4
Maple Rapids, D. Hollister, M. D.	17							2	5	4	4	4	2
Mason, S. H. Culver, M. D.	11										3	4	4
Middleville, G. W. Matteson, M. D.	16	4	5	4	3								
Perry, E. A. Runyan, M. D.	31					4	2	4	5	4	5	3	4
Pottersville, L. E. Higber, M. D.	24							3	4	4	5	4	4
Sheridan, W. H. Budd, M. D.	51	4	5	4	4	5	4	4	5	3	5	4	4
Stanton, W. P. Gamber, M. D.	30							4	5	4	5	4	4
St. Johns, L. W. Pasquille, M. D.	13	4	5	4									
Vernon, D. C. Holly, M. D.	25							4	5	4	5	4	3
Wood's Corners, G. Pray, M. D.	51	4	5	4	4	5	4	4	5	4	5	4	3
Southwestern Division.....*	447	32	38	32	28	41	35	31	44	37	53	39	37
Benton Harbor, J. Bell, M. D.	43			4	4	5	4	4	5	4	5	4	4
Berrien Springs, A. J. Dispenmett, M. D.	17	4	5	4			4						
Berrien Springs, W. F. Mason, M. D.	33					5	4	3	4	4	5	4	4
Bloomington, W. B. Hathaway, M. D.	13	4	5	4									
Cassopolis, D. G. Sharpe, M. D.	20					3	3			3	4	3	4
Douglas, W. B. Clark, M. D.	46	4	5	4	4	5		4	5	4	5	4	2
Hartford, H. C. Maynard, M. D.	50	4	5	4	4	3	4	4	5	4	5	4	4
New Buffalo, A. E. Mason, M. D.	23								5	2	4	4	4
Niles, O. P. Horn, M. D.	52	4	5	4	4	5	4	4	5	4	5	4	4
Otsego, M. Chase, M. D.	52	4	5	4	4	5	4	4	5	4	5	4	4
Otsego, L. E. Clark, M. D.	52	4	5	4	4	5	4	4	5	4	5	4	4
Saugatuck, J. B. Cook, M. D.	19	4	3								5	4	3
South Haven, W. G. Trice, M. D.	27						4	4	5	4	5		
Southern Central Division.....*	1013	71	95	74	76	98	78	76	108	87	94	78	78
Adrian, F. R. Seger, M. D.	49	4	5	4	2	5	3	4	5	4	5	4	4
Albion, F. E. Palmer, M. D.	25					4	3	3	5	4	3		3
Ann Arbor, J. Kapp, M. D.	44	4	5	4	4	5	4	4	5	4	3	2	
Brooklyn, L. M. Jones, M. D.	52	4	5	4	4	5	4	4	5	4	5	4	4
Burr Oak, C. D. Parsons, M. D.	34	4	5	4	4	5	4					4	4
Burr Oak, J. C. Rollman, M. D.	52	4	5	4	4	5	4	4	5	4	5	4	4
Coldwater, L. A. Warsabo, M. D.	52	4	5	4	4	5	4					4	4
Grass Lake, H. J. Hale, M. D.	12							3	3	4			
Hillsdale, W. H. Sawyer, M. D.	12							3	5	4			
Jackson, F. W. Main, M. D.	48	3	5	4	4	5	4	3	5	4		4	4
Jackson, (Prison) N. H. Williams, M. D.	48		5	4	4	5	4	3	5	4	4	4	4
Jonesville, H. M. Warren, M. D.	50	4	5	4	4	5	4	4	5	4	5	4	4
Kalamazoo, H. B. Hemenway, M. D.	52	4	5	4	4	5	4	4	5	4	5	4	3
Kalamazoo, H. H. Schaberg, M. D.	47	4	5	4	4	5	4		5	4	5	4	4
Kalamazoo, W. B. Southard, M. D.	52	4	5	4	4	5	4	4	5	4	5	4	4
Litchfield, George Martin, M. D.	24							2					
Litchfield, J. O. Spinning, M. D.	51	4	5	3	4	5	4	4	5	4	5	4	4
Marshall, E. J. Marshall, M. D.	15	4	5	4	2								
Mendon, H. C. Clapp, M. D.	52	4	5	4	4	5	4	4	5	4	5	4	4

\* For counties in each division see Exhibit I., page 85.

## EXHIBIT V.—CONTINUED.

Divisions and Localities Represented, and Physicians who Reported.  (Health Officers in Italics.)	Weekly Reports in 1888.—Compiled in this Article.												
	Year, 1888.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Southern Central Division.—(Continued.)*													
Norvell, <i>D. Hyndman, M. D.</i> .....	42	---	---	4	4	4	4	4	5	4	5	4	4
Parma, <i>O. S. Hartson, M. D.</i> .....	46	4	5	---	4	5	4	4	4	3	5	4	4
Richland, <i>J. M. Rankin, M. D.</i> .....	52	4	5	4	4	5	4	4	5	4	5	4	4
Union City, <i>E. Brunfield, M. D.</i> .....	52	4	5	4	4	5	4	4	6	4	5	4	4
Vicksburg, <i>F. S. Collar, M. D.</i> .....	25	4	5	3	4	5	4	---	---	---	---	---	---
Vicksburg, <i>C. H. McKain, M. D.</i> .....	25	---	---	---	---	---	---	3	5	4	5	4	4
Southeastern Division.....*													
Armada, <i>S. T. Beardslee, M. D.</i> .....	51	4	5	4	4	5	4	3	5	4	5	4	4
Armada, <i>C. H. Lincoln, M. D.</i> .....	52	4	5	4	4	5	4	4	5	4	5	4	4
Detroit, <i>W. H. Rouse, M. D.</i> .....	51	4	5	4	4	5	4	4	5	4	4	4	4
Farmington, <i>J. J. Moore, M. D.</i> .....	51	4	5	4	4	5	4	4	5	4	4	4	4
Holly, <i>L. E. Wickens, M. D.</i> .....	51	4	5	4	4	5	4	4	5	4	5	4	3
Memphis, <i>D. H. Cole, M. D.</i> .....	52	4	5	4	4	5	4	4	5	4	5	4	4
Monroe, <i>G. F. Heath, M. D.</i> .....	13	4	5	---	4	---	---	---	---	---	---	---	---
New Haven, <i>Alex. Gunn, M. D.</i> .....	52	4	5	4	4	5	4	4	5	4	5	4	4
Northville, <i>J. M. Burgess, M. D.</i> .....	15	4	5	4	2	---	---	---	---	---	---	---	---
Northville, <i>J. M. Swift, M. D.</i> .....	49	4	5	4	4	5	4	4	3	3	5	4	4
Plymouth, <i>J. M. Collier, M. D.</i> .....	13	---	---	---	---	---	---	2	4	4	---	---	3
Pontiac, <i>Mason W. Gray, M. D.</i> .....	52	4	5	4	4	5	4	4	5	4	5	4	4
Romeo, <i>Wm. Greenshields, M. D.</i> .....	52	4	5	4	4	5	4	4	5	4	5	4	4
Wayne, <i>J. M. Truscott, M. D.</i> .....	48	4	5	4	4	5	4	4	5	4	5	4	---
Wyandotte, <i>E. P. Christian, M. D.</i> .....	52	4	5	4	4	5	4	4	5	4	5	4	4

\* For counties in each division see Exhibit I., page 85.

Foot-notes from page 95.

† The numbers opposite the names of the diseases do not state what per cent of the whole number of observers for the year reported the disease present at some time during the year, but state (on an average for the twelve months of the year) by what per cent of the observers making reports for the several months, the disease was reported present in those months. The column for each year is thus a statement for an average month of that year. On the two following pages of this table, however, the columns for each month state what per cent of the observers for that month (the number of whom is stated at the foot of the column) reported the given disease in that month.

[Footnote from pages 89, 90, 91.]

‡ Consumption, remittent fever, and typho-malarial fever were not printed on the first blanks used in making weekly reports (beginning with the month of September, 1876); neuralgia and tonsilitis were not printed on any blanks used prior to October, 1878, and not on all used for several months after that date; inflammation of brain and inflammation of bowels were not printed on any blanks used prior to July, 1879, and not on all used for several months after that date; inflammation of kidney was not printed on any of the cards used prior to October, 1883, and not on all used for several months after that date; hence it is probable that these diseases were not so fully reported at first as were the other diseases.



TABLE 1.—*Stating, for each of the Twelve Years 1877-1888, and the average for 1877-1887, by what Per Cent of Observers each of 28 Diseases was reported present in those Years (also the Average Number of Observers per Month and the Total Observers for each Year).—Compiled from Weekly Reports of Health Officers of Cities and Villages and from Regular Correspondents of the State Board of Health.\*—Diseases arranged in order of Greatest Number of Observers reporting them present in 1888.—(Continued, for each Month of several of the above mentioned Years, on pages 96 and 97).*

Line Number.	Diseases.	Observers by whom the Several Diseases were Reported Present.— Average Per Cents (per month) of those making Reports.†												
		Av. 1877-87.	1888.	1887.	1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.
	Av. for tabulated diseases reported present.....	41	35	37	37	38	42	43	43	45	43	44	39	38
1	Rheumatism.....	83	82	82	85	83	83	83	85	84	85	85	81	78
2	Neuralgia.....‡	82	79	83	83	83	84	85	85	78	79	75	.....	.....
3	Bronchitis.....	74	74	69	71	70	74	79	80	74	77	75	75	71
4	Tonsillitis.....‡	70	64	68	70	72	73	73	72	65	67	68	.....	.....
5	Diarrhea.....	65	60	65	64	66	71	67	69	67	63	65	57	58
6	Intermittent Fever.....	82	53	64	71	73	79	82	83	90	90	90	90	85
7	Consumption, Pul.....‡	72	57	60	64	68	72	71	74	78	76	78	76	.....
8	Pneumonia.....	55	49	46	48	44	48	59	61	60	62	60	58	56
9	Remittent Fever.....‡	61	49	46	48	52	60	57	64	66	67	69	71	68
10	Influenza.....	52	46	46	48	47	53	53	55	48	54	57	57	54
11	Erysipelas.....	43	44	44	43	44	48	47	42	42	45	43	35	35
12	Inflam. of Kidney.....‡	36	33	32	35	34	41	.....	.....	.....	.....	.....	.....	.....
13	Pleuritis.....	.....	32	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
14	Dysentery.....	32	30	33	30	28	38	35	31	31	30	31	30	34
15	Inflam. of Bowels.....‡	30	30	32	32	32	30	31	28	26	25	.....	.....	.....
16	Cholera Morbus.....	32	29	33	29	33	37	32	31	41	34	34	25	26
17	Typho-mal. Fever.....‡	33	25	26	27	27	32	32	39	43	37	32	35	37
18	Measles.....	20	25	22	10	9	17	37	20	37	30	18	7	12
19	Cholera Infantum.....	23	20	24	25	21	26	24	22	27	23	23	20	17
20	Scarlet Fever.....	29	17	15	20	22	29	32	32	32	26	36	38	33
21	Whooping-cough.....	28	16	24	28	21	29	23	26	24	42	31	28	28
22	Typhoid Fever (enteric).....	19	16	15	15	16	20	19	24	26	21	18	16	22
23	Diphtheria.....	34	14	18	24	27	27	31	43	51	43	45	37	32
24	Inflam. of Brain.....‡	13	13	15	13	14	14	12	12	12	13	.....	.....	.....
25	Puerperal Fever.....	12	12	14	12	13	16	15	18	12	8	8	6	10
26	Membranous Croup.....	14	10	10	12	10	14	14	15	19	13	16	14	14
27	Cerebro-Spinal Men.....	9	7	7	8	12	12	11	12	16	6	5	6	6
28	Small-pox.....	1.7	.07	0.01	0.5	0.4	0.2	1	5	4	1	1	1	5
	No. of Observers.....	134	142	155	169	163	142	140	159	116	112	110	97	115
	Av. No. of Observers per month.....	86	102	114	113	104	79	88	93	70	79	73	64	66

\* For 1888, the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit III., page 88; the names of the observers and the number of the reports received from each are stated in Exhibit V., pages 92, 93, 94.

† Foot-notes are on page 94.

TABLE 1. — CONTINUED.—*Per Cent of Observers by whom the Several Diseases were reported for the eleven*

Per Cent of Observers by whom the Diseases were Reported Present.*															
Line Number.	January.*					February.*					March.*				
	Diseases.	Av. 77-'87.	1888.	1887.	1886.	Diseases.	Av. 77-'87.	1888.	1887.	1886.	Diseases.	Av. 77-'87.	1888.	1887.	1886.
	Average.....†	41	35	38	37	Average.....†	40	38	38	37	Average.....†	42	33	39	41
1	Rheumatism.....	86	79	87	86	Bronchitis.....	86	90	79	82	Neuralgia.....	88	88	89	89
2	Neuralgia.....	84	79	87	85	Rheumatism.....	85	87	83	85	Bronchitis.....	86	86	76	86
3	Tonsilitis.....	79	77	74	78	Neuralgia.....	83	83	83	82	Rheumatism.....	86	83	85	88
4	Bronchitis.....	85	77	76	81	Pneumonia.....	80	76	71	68	Tonsilitis.....	80	79	80	83
5	Pneumonia.....	78	67	69	62	Tonsilitis.....	79	75	76	83	Pneumonia.....	79	78	70	80
6	Influenza.....	68	60	56	55	Influenza.....	70	70	60	63	Influenza.....	76	66	62	71
7	Consumpt'n Pul.....	72	56	63	68	Consumpt'n Pul.....	73	62	66	66	Intermittent Fev.....	76	61	62	71
8	Intermittent Fev.....	73	54	59	61	Intermittent Fev.....	72	57	57	66	Consumpt'n Pul.....	75	60	69	72
9	Erysipelas.....	48	44	45	47	Remittent Fev.....	59	55	35	43	Diarrhea.....	47	50	48	46
10	Remittent Fev.....	54	42	43	50	Erysipelas.....	45	54	49	39	Erysipelas.....	47	47	52	44
11	Diarrhea.....	46	41	46	45	Pleuritis.....	51	51	51	51	Remittent Fev.....	54	46	45	48
12	Pleuritis.....	40	40	40	40	Diarrhea.....	44	48	47	48	Measles.....	27	44	37	13
13	Inflam. of Kidney.....	37	34	35	34	Inflam. of Kidney.....	40	43	37	37	Pleuritis.....	40	43	43	43
14	Inflam. of Bowels.....	25	33	28	26	Measles.....	21	33	26	9	Inflam. of Kidney.....	40	38	36	41
15	Measles.....	17	31	18	7	Inflam. of Bowels.....	26	28	25	28	Inflam. of Bowels.....	29	30	33	31
16	Scarlet Fever.....	35	25	21	20	Diphtheria.....	37	21	19	27	Puerperal Fever.....	15	17	20	18
17	Typho-mal. Fever.....	29	20	20	18	Typho-mal. Fever.....	24	20	18	15	Diphtheria.....	35	16	20	25
18	Diphtheria.....	43	16	26	35	Scarlet Fever.....	36	17	21	25	Whooping-cough.....	27	16	25	23
19	Inflam. of Brain.....	13	15	20	14	Whooping-cough.....	26	17	21	22	Croup, Membran.....	17	15	10	11
20	Dysentery.....	15	14	15	13	Puerperal Fever.....	11	16	13	12	Scarlet Fever.....	38	15	26	29
21	Typhoid Fev. (ent.).....	18	14	10	8	Inflam. of Brain.....	14	15	21	12	Inflam. of Brain.....	15	14	16	16
22	Whooping-cough.....	28	14	21	22	Typhoid F. (ent.).....	14	15	13	7	Dysentery.....	16	14	21	16
23	Croup, Membran.....	25	13	22	16	Dysentery.....	12	13	13	13	Typho-mal. Fever.....	22	13	17	25
24	Puerperal Fever.....	13	11	11	12	Croup, Membran.....	19	11	13	13	Cholera Morbus.....	14	11	9	12
25	Cholera Morbus.....	10	8	10	10	Cer.-spinal Men.....	9	8	8	10	Typhoid F. (ent.).....	12	11	7	9
26	Cer.-spinal Men.....	7	5	7	7	Cholera Morbus.....	11	7	9	4	Cer.-spinal Men.....	11	9	7	17
27	Cholera Infantum.....	5	2	8	3	Cholera Infantum.....	4	2	8	2	Cholera Infantum.....	5	4	3	6
28	Small-pox.....	2	1	0	0	Small-pox.....	2	1	0	0	Small-pox.....	1	1	0	0
	Observers.....§	83	91	100	119	Observers.....§	84	87	98	120	Observers.....§	81	98	89	112
Line Number.	April.*					May.*					June.*				
	Diseases.	Av. 77-'87.	1888.	1887.	1886.	Diseases.	Av. 77-'87.	1888.	1887.	1886.	Diseases.	Av. 77-'87.	1888.	1887.	1886.
	Average.....†	41	38	37	38	Average.....†	40	37	37	37	Average.....†	39	34	38	37
1	Rheumatism.....	88	89	86	89	Rheumatism.....	86	86	81	86	Rheumatism.....	84	85	84	86
2	Neuralgia.....	86	84	84	85	Neuralgia.....	82	82	83	83	Neuralgia.....	81	75	82	79
3	Bronchitis.....	83	79	75	82	Bronchitis.....	77	75	72	73	Bronchitis.....	69	74	70	69
4	Tonsilitis.....	74	72	76	71	Tonsilitis.....	70	67	69	63	Consumpt'n Pul.....	69	66	66	65
5	Pneumonia.....	75	68	64	67	Pneumonia.....	63	64	58	51	Intermittent Fev.....	67	59	69	79
6	Consumpt'n Pul.....	75	57	67	69	Consumpt'n Pul.....	74	62	61	68	Tonsilitis.....	64	55	63	64
7	Intermittent Fev.....	82	57	65	74	Intermittent Fev.....	86	62	71	70	Diarrhea.....	66	55	77	67
8	Influenza.....	64	55	55	72	Measles.....	37	57	41	17	Remittent Fev.....	61	47	44	54
9	Erysipelas.....	48	50	52	48	Influenza.....	53	53	50	45	Erysipelas.....	42	45	44	42
10	Measles.....	32	50	38	9	Remittent Fev.....	59	50	43	48	Pneumonia.....	44	44	34	43
11	Diarrhea.....	50	47	49	51	Diarrhea.....	55	49	48	52	Measles.....	31	44	29	15
12	Remittent Fev.....	57	43	41	49	Erysipelas.....	48	48	46	51	Influenza.....	40	35	40	42
13	Pleuritis.....	41	41	41	41	Inflam. of Kidney.....	37	39	34	36	Inflam. of Kidney.....	38	34	37	40
14	Inflam. of Kidney.....	39	36	38	40	Pleuritis.....	38	37	30	36	Cholera Morbus.....	40	29	52	27
15	Inflam. of Bowels.....	26	28	27	27	Inflam. of Bowels.....	28	31	30	36	Pleuritis.....	30	23	36	32
16	Scarlet Fever.....	34	25	14	23	Scarlet Fever.....	30	22	10	21	Inflam. of Bowels.....	30	23	36	32
17	Typho-mal. Fever.....	20	21	21	18	Whooping-cough.....	29	22	26	32	Cholera Infantum.....	26	19	26	27
18	Whooping-cough.....	25	19	24	21	Typho-mal. Fever.....	21	22	14	20	Typho-mal. Fever.....	32	17	17	20
19	Diphtheria.....	32	18	9	21	Dysentery.....	17	21	20	18	Whooping-cough.....	28	17	27	31
20	Croup, Membran.....	14	16	15	7	Cholera Morbus.....	20	19	27	15	Dysentery.....	36	15	30	17
21	Dysentery.....	15	16	12	12	Croup, Membran.....	11	14	10	10	Scarlet Fever.....	27	13	9	20
22	Puerperal Fever.....	11	15	16	18	Diphtheria.....	28	14	12	25	Inflam. of Brain.....	14	11	21	16
23	Inflam. of Brain.....	16	13	11	17	Puerperal Fever.....	12	14	9	10	Diphtheria.....	26	10	13	18
24	Cholera Morbus.....	14	13	11	11	Inflam. of Brain.....	14	10	15	11	Puerperal Fever.....	13	8	17	15
25	Typhoid Fev. (ent.).....	10	9	5	5	Cholera Infantum.....	9	9	13	12	Cer.-spinal Men.....	9	7	10	5
26	Cer.-spinal Men.....	13	9	7	8	Typhoid F. (ent.).....	9	8	5	7	Typhoid F. (ent.).....	10	7	9	7
27	Cholera Infantum.....	5	4	5	5	Cer.-spinal Men.....	11	6	10	7	Croup, Membran.....	8	6	4	8
28	Small-pox.....	2	0	0	0	Small-pox.....	3	1	0	0	Small-pox.....	2	0	0	1
	Observers.....§	76	96	85	100	Observers.....§	82	102	100	105	Observers.....§	84	100	108	109

\* For 1888 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit III., page 88, the names of observers and the number of reports received from each are stated in Exhibit V., pages 92-94. † The numbers in this line are an average, not for all diseases represented, but only for those reported present in the given month. ‡ See foot-note with this mark on page 94. § The numbers in this line state how many observers reported for the month in the given year. aFor first part of Table 1, and full heading, see page 95.

Reported Present by Months in each of Years 1886-1888, and the Average, by Months, years, 1877-1887.

Per Cent of Observers by whom the Diseases were Reported Present.\*

July.*					August.*					September.*				
Diseases.					Diseases.					Diseases.				
	Av. 1877-'87.	1886.	1887.	1888.		Av. 1877-'87.	1886.	1887.	1888.		Av. 1877-'87.	1886.	1887.	1888.
Average.....†	42	34	39	38	Average.....†	43	39	44	39	Average.....†	45	37	38	42
Diarrhea.....	91	83	94	87	Diarrhea.....	97	92	96	94	Diarrhea.....	94	86	86	92
Neuralgia.....	78	78	79	81	Neuralgia.....	75	78	83	75	Rheumatism.....	76	78	75	81
Rheumatism.....	78	75	76	82	Dysentery.....	75	76	80	65	Dysentery.....	70	67	58	69
Cholera Morbus.....	71	59	76	68	Cholera Morbus.....	71	75	78	68	Bronchitis.....	61	66	59	54
Intermitt. Fever.....	67	59	65	79	Rheumatism.....	74	72	81	76	Neuralgia.....	76	64	85	73
Consump., Pul.....	68	57	56	58	Bronchitis.....	55	63	55	54	Intermitt. Fever.....	88	62	70	77
Bronchitis.....	59	54	55	56	Cholera Infant.....	68	62	73	63	Cholera Morbus.....	65	59	55	66
Dysentery.....	52	49	65	43	Remitt'nt Fever.....	69	62	55	47	Remitt'nt Fever.....	72	56	55	69
Tonsillitis.....	54	43	45	55	Intermitt. Fever.....	88	62	71	76	Cholera Infant.....	57	52	39	69
Cholera Infantum.....	50	42	65	49	Consump., Pul.....	66	59	61	59	Consump., Pul.....	66	50	51	57
Remitt'nt Fever.....	65	41	44	53	Tonsillitis.....	54	44	56	52	Tonsillitis.....	60	50	56	65
Inflam. of Bowels.....	35	38	37	35	Erysipelas.....	36	33	39	38	Typho-mal. Fev.....	56	42	49	44
Erysipelas.....	40	33	35	41	Inflam. of Bowels.....	37	33	48	37	Influenza.....	42	32	40	34
Inflam. of Kidney.....	32	28	33	33	Inflam. of Kidney.....	30	32	28	30	Erysipelas.....	33	31	33	40
Pneumonia.....	31	26	21	21	Typho-mal. Fev.....	41	27	43	39	Inflam. of Bowels.....	32	28	33	40
Influenza.....	31	22	24	25	Pneumonia.....	25	25	19	22	Typhoid F. (ent.).....	31	28	32	29
Measles.....	23	18	24	28	Influenza.....	33	24	33	30	Pneumonia.....	31	27	28	27
Pleuritis.....	16	11	12	12	Typhoid F. (ent.).....	24	23	27	24	Inflam. of Kidney.....	27	19	23	26
Typhoid F. (ent.).....	13	16	11	12	Pleuritis.....	20	20	20	20	Pleuritis.....	18	18	18	19
Whooping-cough.....	32	13	33	34	Inflam. of Brain.....	16	16	14	13	Diphtheria.....	30	16	14	23
Typho-mal. Fev.....	27	13	22	27	Diphtheria.....	27	15	13	18	Whooping-cough.....	29	16	20	36
Inflam. of Brain.....	13	11	14	14	Whooping-cough.....	32	15	32	37	Scarlet Fever.....	21	12	13	15
Scarlet Fever.....	22	11	5	12	Puerperal Fever.....	12	12	16	11	Inflam. of Brain.....	13	11	10	11
Puerperal Fever.....	11	11	12	8	Measles.....	13	9	11	9	Puerperal Fever.....	11	10	16	10
Diphtheria.....	26	8	13	16	Scarlet Fever.....	20	7	12	13	Measles.....	5	8	8	9
Cer.-spinal Men.....	9	5	8	11	Cer.-spinal Men.....	9	7	8	6	Cer.-spinal Men.....	9	6	4	8
Croup, Membran.....	4	2	2	6	Croup, Membran.....	6	4	4	6	Croup, Membran.....	9	4	5	11
Small-pox.....	2	0	0	1	Small-pox.....	1	0	0	0.8	Small-pox.....	1	0	1	0.9
Observers.....‡	88	109	110	118	Observers.....‡	90	110	108	123	Observers.....‡	88	109	105	118
October.*					November.*					December.*				
Diseases.					Diseases.					Diseases.				
	Av. 1877-'87.	1886.	1887.	1888.		Av. 1877-'87.	1886.	1887.	1888.		Av. 1877-'87.	1886.	1887.	1888.
Average.....†	43	38	37	38	Average.....†	41	32	39	36	Average.....†	40	33	35	38
Rheumatism.....	83	87	82	86	Rheumatism.....	81	82	86	86	Rheumatism.....	86	83	83	88
Neuralgia.....	80	83	83	81	Tonsillitis.....	76	76	81	71	Bronchitis.....	83	80	78	78
Bronchitis.....	80	74	69	64	Neuralgia.....	83	76	84	83	Neuralgia.....	84	78	80	89
Intermitt. Fever.....	86	67	64	76	Bronchitis.....	73	72	76	74	Tonsillitis.....	81	72	79	85
Tonsillitis.....	68	64	70	69	Intermitt. Fever.....	80	57	62	64	Consump., Pul.....	70	57	56	62
Diarrhea.....	71	63	69	73	Consump., Pul.....	71	52	63	63	Influenza.....	60	52	51	54
Remitt'nt Fever.....	69	58	54	45	Diarrhea.....	56	50	58	57	Intermitt. Fever.....	74	51	54	61
Consump., Pul.....	71	51	58	58	Influenza.....	55	48	53	51	Erysipelas.....	43	50	44	44
Typho-mal. Fev.....	57	50	41	39	Pneumonia.....	55	43	53	43	Pneumonia.....	66	50	48	66
Erysipelas.....	41	46	42	42	Remitt'nt Fever.....	61	43	45	46	Remitt'nt Fever.....	56	45	47	41
Influenza.....	46	44	39	37	Erysipelas.....	41	42	57	40	Diarrhea.....	47	42	49	52
Pneumonia.....	39	39	31	27	Typho-mal. Fev.....	45	33	28	35	Pleuritis.....	38	38	38	38
Dysentery.....	46	36	32	44	Pleuritis.....	30	30	30	30	Inflam. of Kidney.....	36	32	29	39
Pleuritis.....	32	32	24	34	Inflam. of Kidney.....	34	28	31	33	Inflam. of Bowels.....	29	26	30	34
Inflam. of Bowels.....	29	31	24	34	Inflam. of Bowels.....	27	26	26	24	Typho-mal. Fev.....	34	25	12	38
Inflam. of Kidney.....	37	30	38	28	Dysentery.....	23	19	25	25	Scarlet Fever.....	31	25	22	23
Typhoid F. (ent.).....	34	29	26	29	Typhoid F. (ent.).....	30	19	22	22	Whooping-cough.....	26	18	12	25
Cholera Morbus.....	32	27	23	28	Scarlet Fever.....	27	17	18	16	Typhoid F. (ent.).....	23	14	16	18
Cholera Infant.....	26	19	13	31	Inflam. of Brain.....	11	14	9	8	Inflam. of Brain.....	12	12	13	17
Whooping-cough.....	26	17	20	26	Cholera Morbus.....	15	14	16	13	Croup, Membran.....	21	12	14	22
Scarlet Fever.....	26	16	16	20	Whooping-cough.....	26	13	20	27	Diphtheria.....	42	12	22	29
Croup, Membran.....	14	14	11	19	Diphtheria.....	43	10	33	28	Cholera Morbus.....	13	10	12	13
Diphtheria.....	41	14	25	25	Puerperal Fever.....	12	9	12	10	Dysentery.....	15	9	19	15
Inflam. of Brain.....	11	11	12	8	Croup, Membran.....	20	8	19	21	Puerperal Fever.....	11	8	11	14
Puerperal Fever.....	11	11	10	13	Cholera Infant.....	10	8	8	12	Cholera Infant.....	5	6	5	6
Measles.....	8	10	10	10	Measles.....	11	6	16	10	Cer.-spinal Men.....	7	5	4	8
Cer.-spinal Men.....	9	6	5	8	Cer.-spinal Men.....	7	6	6	7	Measles.....	14	4	18	11
Small-pox.....	1	0	0	1	Small-pox.....	1	2	0	1	Small-pox.....	2	2	0	1
Observers.....‡	88	105	100	118	Observers.....‡	85	105	117	112	Observers.....‡	84	109	94	105

\* , † , ‡. See notes with these marks on page 96.

‡ For this foot-note see page 96.



For the	Whole number of localities	Average number of observers	46	69	32	27	30	27	29	33	31	35	30	31	31	30	31
Influenza.....	.....	.....	46	69	32	27	30	27	29	33	31	35	30	31	31	30	31
Kidney, Inflammation of.....	.....	.....	33	57	19	45	49	47	44	50	.....	.....	.....	.....	.....	.....	.....
Measles.....	.....	.....	25	62	16	32	36	50	64	52	37	44	48	47	53	50	48
Neuralgia.....	.....	.....	79	78	62	27	28	28	28	33	33	43	45	45	.....	.....	.....
Pleuritis.....	.....	.....	32	54	18	44	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pneumonia.....	.....	.....	49	60	30	40	43	40	44	45	47	54	51	52	48	40	46
Puerperal Fever.....	.....	.....	12	37	4	46	57	59	63	69	73	82	78	72	63	61	67
Rheumatism.....	.....	.....	82	80	66	30	32	32	32	36	37	46	46	46	42	40	39
Scarlatina.....	.....	.....	17	55	9	46	50	45	50	52	52	67	65	55	54	48	53
Small-pox.....	.....	.....	07	47	03	153	260	259	84	260	140	91	89	63	39	68	133
Tonsillitis.....	.....	.....	64	63	41	34	34	34	35	37	39	45	44	45	.....	.....	.....
Whooping-cough.....	.....	.....	16	56	9	39	42	37	41	45	52	63	55	47	48	51	48

\* For counties in each Division, see Exhibit I., page 85.

† For number of Observers, reports, weeks in each month, etc., see Exhibit III., page 88; for names of observers, and number of reports received from each, see Exhibit V., pages 92-94.

a. Not every one of the observers sent in a report for every week, so that the number of reports received does not equal the number of observers multiplied by the number of weeks.

b. The numbers in this column, (pages 98, 99,) state not what per cent of the whole number of observers for the year reported the disease present at some time during the year, but the averages (for the twelve months) of the per cents (of observers making reports for the several months) by which the disease was reported present in those months. The column for the year is thus a statement for an average month. But on pages 100 and 101 the numbers in the "Per Cent of Observers" column are statements for the month, and not averages. This column indicates the Area of Prevalence except that in a few instances there were two or more observers in one city or village.

c. This column states for the year or given month, what per cent the number of reports which stated a disease to be present is of the number of cards-reports received, for the given time, from each of the observers as reported the diseases present. It is therefore an average not for all localities represented, but only for those at which the given disease was reported present. In the line "Average for Tabulated Diseases" it states what per cent the number of times all diseases were reported present is of the number of times they might have been so reported on the cards received, for the time specified, from the observers who during that time reported the diseases present (that is, if each of the observers had on every card he sent reported every disease present which he reported present at all). It will be seen that this is a more accurate average than would be obtained by dividing the sum of the column by the number of diseases reported present.

d. This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from all observers in the State or Division, as the case may be. It combines, and states in a general way, an idea of the time a disease was prevalent, with an idea of the area of its prevalence. Had every observer sent a report every week of the month or year, the numbers in this column would be (for the State) the product of the numbers in the same line in the two preceding columns.

e. The disease having the greatest number of cases to be marked 1 in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals (for the State) of the Order of Prevalence column, in Table 3 (a table giving statements for each locality omitted in printing this Report, for want of room), by the number of men who reported the disease present. The column is, therefore, an average not for all the localities represented but only for those at which the given disease was reported present. The numbers in the "Average" lines for this column are found by dividing the sum of the totals in the Order of Prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of men who reported the diseases present, thus counting each man once for every disease he reported present. As a rule, small numbers in this column indicate a large prevalence of the disease, and *vice versa*, but the greater the number of diseases reported present by each observer from week to week, the greater will be the "average" in this column.



Av. for Tab. Dis. Rep. Pres. ....	July											
	34	64	22	3.2	39	63	25	3.5	37	67	25	3.6
Brain, Inflammation of .....	11	48	5	6.4	16	33	5	5.7	11	53	6	6.2
Bowels, Inflammation of .....	38	45	17	4.9	33	48	16	4.4	28	31	14	4.6
Bronchitis .....	54	75	41	2.9	63	62	39	3.8	46	74	49	3.5
Cerebro-spinal Meningitis .....	5	44	2	4.2	7	26	2	5.3	6	32	2	2.9
Cholera Infantum .....	42	56	23	3.5	62	64	40	3.3	52	57	29	4.0
Cholera Morbus .....	59	56	33	3.1	75	65	48	3.0	59	58	34	3.8
Consumption, Pulmonary .....	57	88	51	3.3	59	82	49	3.7	50	86	44	3.9
Croup, Membranous .....	2	25	0.5	6.0	4	21	0.8	4.3	4	43	1	3.8
Diphtheria .....	8	57	5	4.6	15	39	6	5.3	15	43	7	6.5
Diarrhea .....	83	73	60	2.0	92	85	78	1.7	86	84	73	2.0
Dysentery .....	49	52	25	3.5	76	66	51	3.1	67	65	43	3.3
Erysipelas .....	33	58	19	3.9	38	51	20	4.1	31	52	17	4.7
Fever, Intermittent .....	59	78	47	2.2	62	73	46	2.6	62	77	48	2.2
Fever, Remittent .....	41	68	28	2.9	62	67	41	3.0	56	82	47	2.6
Fever, Typhoid (Enteric) .....	16	45	7	3.4	23	54	12	4.2	28	62	18	4.0
Fever, Typho-malarial .....	13	52	7	3.9	27	57	16	4.0	42	61	26	3.2
Influenza .....	22	55	13	3.5	24	51	12	4.0	32	58	19	4.1
Kidney, Inflammation of .....	25	50	15	3.9	32	51	16	4.6	19	68	14	5.7
Measles .....	18	52	10	3.5	9	38	3	4.8	8	39	3	4.6
Nervalgia .....	78	73	57	2.4	78	73	58	3.0	64	78	51	3.3
Pleuritis .....	16	49	8	4.6	20	41	8	4.5	13	52	9	5.4
Pneumonia .....	26	47	13	4.1	25	39	10	5.3	27	57	15	5.0
Puerperal Fever .....	11	39	4	2.9	12	25	3	3.9	10	44	4	2.9
Rheumatism .....	75	76	53	3.0	72	72	53	3.5	78	76	61	3.4
Scarlatina .....	11	53	6	4.0	7	51	4	5.5	12	51	6	5.8
Small-pox .....	0	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis .....	43	55	24	3.3	44	47	21	4.5	50	53	27	3.8
Whooping-cough .....	13	59	8	4.4	15	46	7	4.3	16	54	9	3.8

July





Av. for Tab. Dis. Rep Pres...	18	17	23	53	0	25	26	27	27	31	28	20	20	Northeastern Division.*										29	23	41	37	42	40	39	27	22	34	32	30	47	31
Brain, Inflammation of.....	2	2	0	0	0	0	0	0	7	5	0	0	6	0	4	1	0	0	8	0	0	0	6	0	0	0	0	0	0	0	0	0	0				
Bowels, Inflammation of.....	3	13	0	0	0	0	0	20	15	6	23	20	25	0	22	12	17	7	25	19	0	13	25	15	0	11	17	0	0	0	0	0	0				
Bronchitis.....	42	39	30	50	0	0	36	40	47	30	38	40	50	0	61	69	67	73	75	94	92	50	44	35	75	83	67	75	0	0	0	0	0				
Cerebro-spinal Meningitis.....	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0				
Cholera Infantum.....	6	17	0	0	0	0	0	27	50	56	7	0	0	0	11	11	0	0	0	8	13	31	54	8	0	0	0	0	0	0	0	0	0				
Cholera Morbus.....	5	13	0	0	0	0	0	20	30	50	7	0	0	0	14	11	0	0	0	6	8	13	45	8	6	0	0	0	0	0	0	0	0				
Consumption, Pulmonary.....	17	39	0	0	0	25	36	50	47	50	44	57	33	38	61	37	42	33	33	44	54	31	25	23	28	42	44	0	0	0	0	0	0				
Group, Membranous.....	1	3	20	0	0	25	0	0	0	0	0	0	6	0	10	2	0	0	17	0	0	6	0	0	0	0	0	0	0	0	0	0	0				
Diphtheria.....	8	1	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Diarrhea.....	34	21	0	25	0	6	14	0	20	30	36	27	25	0	54	54	8	33	58	50	63	50	81	85	44	50	31	0	0	0	0	0	0				
Dysentery.....	20	25	0	0	0	0	7	10	27	50	43	36	13	0	27	27	19	0	23	0	25	8	13	38	75	25	6	0	0	0	0	0	0	0			
Erysipelas.....	8	42	0	0	0	0	36	40	40	50	30	71	53	41	20	20	33	8	31	21	31	13	25	17	17	0	0	0	0	0	0	0	0	0			
Fever, Intermittent.....	29	11	30	100	0	0	29	0	0	5	6	14	0	0	22	51	50	53	50	56	58	38	25	50	67	56	50	6	0	0	0	0	0	0			
Fever, Remittent.....	6	7	0	75	0	0	0	20	0	5	13	7	0	0	21	8	0	7	0	6	0	6	0	0	25	22	33	0	0	0	0	0	0	0			
Fever, Typhoid (Enteric).....	10	7	0	0	0	0	0	0	13	5	13	21	7	6	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0			
Fever, Typho-malarial.....	9	19	0	0	0	0	0	0	20	35	31	29	33	13	9	5	0	0	0	6	13	19	0	5	0	0	0	0	0	0	0	0	0	0	0		
Influenza.....	27	6	0	25	0	0	21	10	0	0	0	7	0	0	33	57	67	87	75	25	43	50	56	50	33	61	58	58	19	0	0	0	0	0			
Kidney, Inflammation of.....	6	12	0	0	0	0	36	0	7	0	0	27	25	0	34	19	25	13	25	44	21	38	6	15	0	11	0	0	0	0	0	0	0	0			
Measles.....	9	11	30	0	0	25	14	0	7	0	0	21	7	25	28	8	28	8	33	50	50	63	50	19	5	25	11	0	0	0	0	0	0	0			
Neuralgia.....	49	44	0	25	0	0	50	30	53	45	44	53	56	0	56	56	58	60	58	81	79	25	44	50	33	61	67	38	61	67	38	61	67	38			
Pleuritis.....	19	0	0	75	0	0	0	0	27	20	25	20	25	0	6	0	0	0	19	8	0	0	0	0	0	8	11	17	13	0	0	0	0	0			
Pneumonia.....	22	8	10	0	0	25	14	0	13	10	0	7	13	13	35	24	33	0	42	19	38	25	38	20	17	11	25	25	0	0	0	0	0	0			
Puerperal Fever.....	7	8	0	0	0	0	0	0	10	31	7	0	0	0	4	1	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Rheumatism.....	55	48	20	0	0	25	43	40	53	50	50	61	53	63	79	57	75	67	58	88	92	44	25	35	67	50	42	38	0	0	0	0	0	0			
Scarlatina.....	4	6	0	0	0	0	0	0	0	0	0	7	20	25	7	2	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Small-pox.....	30	26	0	50	0	25	36	20	33	15	25	23	33	31	72	46	75	63	67	69	63	25	38	20	17	28	67	56	31	0	0	0	0	0			
Tonsillitis.....	10	14	0	0	0	0	0	10	0	0	6	29	33	30	6	20	17	25	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
*Whooping-cough.....																																					

\*. †. d. See page 99. ‡Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 8 years, 1880-7; for neuralgia and tonsillitis, an average for the 3 years, 1885-8; for other diseases and for the average line, an average for the 11 years 1857-87. For the Northern Division 1857-87. For the Northeastern Division 1853-87.

Northern Division.\*

TABLE 2.—CONTINUED.—Diseases in the Western, Northern Central, Bay and Eastern, and the Central Divisions of the State, for the Years 1877-1887, and by Months in 1888, indicating what per cent of the Weekly reports received Stated the Presence of the Disease Named.

Diseases.	Western Division.*												Northern Central Division.*												Division.*																				
	1877-87,†	1888,†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	1877-87,†	1888,†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	1877-87,†	1888,†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.			
Av. for Tab. Dis. Rep. Pres.---	32	22	31	33	31	29	29	26	21	26	28	26	27	27	28	19	36	27	26	35	32	32	26	27	28	36	27	32	28	19	36	27	26	35	32	32	26	27	28	36	27	32			
Brain, Inflammation of.....	5	4	0	0	10	4	0	4	0	13	7	0	0	4	3	2	0	0	0	0	0	0	0	0	0	0	0	0	6	5	17	8	21	4	10	15	17	8	0	19	14	0	0	6	5
Bowels, Inflammation of.....	17	8	21	4	10	15	17	8	7	6	0	0	0	7	9	5	0	0	0	8	5	8	0	19	14	0	0	6	5	17	8	21	4	10	15	17	8	0	19	14	0	0	6	5	
Bronchitis.....	55	49	67	92	73	59	57	38	37	41	36	37	29	32	51	54	67	60	50	67	45	42	63	44	36	61	56	60	51	54	67	60	50	67	45	42	63	44	36	61	56	60			
Cerebro-spinal Meningitis....	0	3	4	0	0	0	0	0	0	0	0	0	0	0	8	4	0	7	0	0	15	8	6	0	0	0	0	0	0	12	9	0	7	0	0	8	6	0	0	0	0	0	0		
Cholera Infantum.....	16	2	0	0	0	0	0	8	10	9	0	0	0	0	18	5	0	0	0	0	0	0	0	0	0	0	0	0	18	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cholera Morbus.....	21	7	8	0	3	0	3	4	13	22	18	9	0	0	18	5	0	0	0	0	0	0	0	0	0	0	0	0	18	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Consumption, Pulmonary.....	48	40	17	20	40	22	48	46	40	50	46	54	36	46	35	17	25	20	7	8	0	42	31	6	36	22	22	6	35	17	25	20	7	8	0	42	31	6	36	22	22	6	35		
Croup, Membranous.....	7	6	21	12	13	11	10	0	0	3	0	3	7	0	9	3	8	0	0	0	0	8	6	0	0	0	0	0	10	7	9	3	8	0	8	6	0	0	0	0	0	10			
Diphtheria.....	26	6	13	20	7	11	0	0	3	3	11	3	4	7	28	3	0	0	0	0	0	0	0	0	0	0	0	0	20	6	13	20	7	11	0	0	0	0	0	0	0	20			
Diarrhea.....	47	39	17	28	50	26	10	27	47	78	82	37	29	21	47	28	0	0	21	33	25	50	63	75	57	17	11	0	47	28	0	0	21	33	25	50	63	75	57	17	11	0	47		
Dysentery.....	25	15	4	0	7	0	0	4	30	66	39	11	4	4	18	6	17	0	0	0	0	0	0	13	31	14	0	6	0	25	15	4	0	7	0	0	0	13	31	14	0	6	0	6	
Erysipelas.....	30	20	25	40	13	19	10	15	7	19	18	17	32	32	23	23	0	20	21	25	45	17	19	0	0	28	33	45	23	23	0	20	21	25	45	17	19	0	0	28	33	45			
Fever, Intermittent.....	74	61	33	20	67	52	59	62	37	69	64	74	68	64	67	56	33	40	64	58	75	58	56	56	43	67	61	45	67	56	33	40	64	58	75	58	56	43	67	61	45				
Fever, Remittent.....	62	31	38	52	20	15	4	23	67	50	45	26	14	18	55	34	33	27	29	0	30	30	25	44	57	39	0	35	62	31	38	52	20	15	4	23	67	50	45	26	14	18			
Fever, Typhoid (Enteric).....	10	8	0	4	0	0	0	0	0	16	4	20	18	29	9	3	0	0	0	0	0	0	6	13	7	0	0	0	10	8	0	4	0	0	0	6	13	7	0	0	0	0	0		
Fever, Typho-malarial.....	26	13	4	20	10	4	21	19	17	13	11	20	36	29	29	14	0	7	7	0	15	0	6	6	43	44	11	20	26	13	4	20	10	4	21	19	17	13	11	20	36	29			
Influenza.....	46	35	67	61	57	52	21	19	17	3	3	0	0	0	11	2	0	7	7	0	5	0	0	0	0	0	6	0	46	35	67	61	57	52	21	19	17	3	3	0	0	6			
Kidney, Inflammation of.....	16	6	8	8	7	15	0	0	0	3	3	0	0	18	14	7	8	0	7	0	20	8	6	6	7	0	0	10	16	6	8	8	7	15	0	0	0	6	7	0	0	10			
Malaria.....	14	11	0	12	13	30	34	62	3	0	0	0	0	7	15	18	8	27	7	67	60	42	50	31	29	44	0	0	45	14	11	0	12	13	30	34	62	3	0	0	7	67	60		
Neuracela.....	73	63	63	89	83	89	52	62	40	59	43	51	57	46	55	44	58	47	43	25	60	42	50	31	29	44	0	45	73	63	63	89	83	89	52	62	40	59	43	51	57	46			
Pleuritis.....	16	29	36	23	15	17	19	10	13	11	14	7	7	7	....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	29	36	23	15	17	19	10	13	11	14	7	7			
Pneumonia.....	38	28	46	60	53	37	41	38	3	9	14	9	4	32	30	38	75	67	50	33	15	17	0	0	7	11	56	70	38	28	46	60	53	37	41	38	3	9	14	9	4	32			
Puerperal Fever.....	6	7	4	4	3	4	10	15	10	0	0	0	0	0	5	5	0	0	0	0	15	0	6	0	6	0	0	0	6	6	7	4	4	3	4	10	15	10	0	0	0	6			
Rheumatism.....	62	61	79	68	70	74	55	65	57	50	46	57	54	68	56	53	58	53	50	50	55	67	38	63	43	56	50	60	62	61	79	68	70	74	55	65	57	50	46	57	54	68			
Scarlatina.....	23	8	17	16	13	22	0	0	13	0	0	0	3	0	7	7	17	13	7	8	0	0	0	0	6	21	11	0	23	8	17	16	13	22	0	0	13	0	0	6	21	11			
Small-pox.....	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0		
Tonsillitis.....	55	42	58	80	70	48	31	19	10	16	29	37	61	57	57	44	50	40	57	42	40	42	13	13	36	61	78	55	55	42	58	80	70	48	31	19	10	16	29	37	61	57			
Whooping-cough.....	16	8	4	0	0	15	24	23	20	6	4	3	0	0	15	5	17	13	14	42	15	0	0	0	0	0	0	0	16	8	4	0	0	15	24	23	20	6	4	3	0	0	0		

Av. for Tab. Dis. Rep. Pres....	33	21	27	28	26	22	23	25	26	25	25	30	Central Division.*											27	22	27	26	29	26	24	21	23	25	22	21	21
Brain, Inflammation of.....	6	5	3	8	5	5	4	3	0	3	5	6	13	6	5	5	5	4	5	2	1	7	9	5	5	7	6	4	7	6	4					
Bowels, Inflammation of.....	21	19	16	23	21	21	12	20	13	21	19	19	21	25	13	17	34	16	24	10	21	11	16	20	14	13	15	17	13	16	17					
Bronchitis.....	69	61	75	82	60	60	63	55	45	43	50	57	65	71	54	51	54	69	68	63	53	57	34	24	44	56	51	60	51	60						
Cerebro-spinal Meningitis.....	6	3	0	8	5	5	1	8	0	2	2	0	0	0	4	6	7	10	12	2	2	1	8	7	3	1	7	9	4	7	9					
Cholera Infantum.....	17	14	2	7	7	7	2	12	23	45	36	14	5	10	15	11	7	0	0	2	0	2	18	27	22	21	1	3	2	2	6					
Cholera Morbus.....	21	17	0	1	5	5	3	18	43	59	39	12	5	6	15	14	0	3	2	2	0	11	26	44	37	8	9	6	9	6						
Consumption, Pulmonary.....	67	46	46	49	48	48	47	46	45	44	39	44	43	47	59	43	40	49	59	52	49	51	43	39	28	28	34	52	34	52						
Croup, Membranous.....	10	3	3	0	10	10	2	3	0	0	2	1	2	0	3	2	7	6	2	4	0	0	0	3	0	3	1	4	4	3	1					
Diphtheria.....	27	3	8	8	3	3	3	2	0	0	2	1	2	0	21	5	4	0	9	5	2	0	11	3	4	7	9	6	7	9	6					
Diarrhea.....	50	39	26	26	26	26	24	37	62	75	77	37	24	19	42	40	20	13	12	25	24	34	59	86	73	34	33	31	31	31	31					
Dysentery.....	20	15	8	7	14	14	7	11	27	45	30	11	8	8	14	14	4	1	3	0	6	5	21	48	46	7	4	1	4	1	4					
Erysipelas.....	25	23	30	23	29	29	27	20	10	15	23	27	25	34	19	18	29	26	29	33	19	15	9	15	10	13	13	21	13	21	13	21				
Fever, Intermittent.....	76	39	31	42	48	48	36	43	33	41	42	37	29	34	72	53	50	40	53	56	61	56	58	54	63	59	48	41	41	41	41					
Fever, Remittent.....	45	31	31	33	34	34	26	23	18	29	41	35	37	35	46	43	30	39	47	42	47	41	32	51	59	48	39	35	35	35	35					
Fever, Typhoid (Enteric).....	9	7	3	1	3	3	6	2	3	5	19	19	15	10	12	8	13	3	0	2	0	0	3	4	19	14	11	7	7	7	7					
Fever, Typho-malarial.....	29	21	23	43	45	45	33	22	13	14	37	35	42	18	36	29	46	69	61	46	30	20	3	15	22	27	24	10	10	10	10					
Influenza.....	42	34	43	53	45	45	33	22	13	14	14	37	35	42	36	29	46	69	61	46	30	20	3	15	22	27	24	10	10	10	10					
Kidney, Inflammation of.....	22	15	26	16	22	22	12	9	8	13	13	15	15	21	21	16	23	19	36	15	19	18	12	13	12	10	11	17	17	17	17					
Measles.....	15	16	25	34	28	28	34	5	3	0	1	0	0	0	9	14	11	16	15	29	39	33	16	3	8	9	3	5	5	5	5					
Neuralgia.....	70	62	67	64	76	76	62	54	48	53	44	69	69	69	63	70	73	77	85	65	69	70	67	67	53	72	69	72	69	72	69					
Pleuritis.....	26	43	51	31	31	31	28	20	7	3	14	21	18	37	....	14	21	26	22	25	20	11	4	2	3	12	15	15	15	15	15					
Pneumonia.....	40	31	36	52	38	38	43	20	12	11	14	19	25	37	33	21	39	44	42	48	23	20	12	12	10	15	16	16	16	16	16					
Puerperal Fever.....	5	4	0	10	2	2	0	0	0	4	6	7	3	4	6	2	4	5	2	3	3	4	1	0	3	2	3	2	3	2	3					
Rheumatism.....	75	65	61	70	69	69	60	62	50	46	63	78	73	77	41	63	52	63	64	65	69	67	64	49	60	69	68	65	65	65	65					
Scarlatina.....	18	6	10	11	10	10	6	3	3	1	2	7	3	11	12	9	7	6	7	29	11	15	4	1	3	7	9	15	15	15	15					
Small-pox.....	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.6	0	0	0	0	0	0	0	0	0	0	1	5	5	5	5					
Tonsillitis.....	52	35	33	32	34	34	31	38	20	26	27	35	40	55	41	36	59	54	49	42	39	31	21	16	18	34	43	42	42	42	42					
Whooping-cough.....	25	11	3	5	9	9	13	14	8	8	14	9	17	21	17	5	0	10	7	2	0	5	1	8	12	4	1	6	6	6	6	6				

\*. t. d. See page 99. † Inflammation of kidney was not compiled until 1884. For inflam. of brain and inflam. of bowels, an average for the 8 years, 1880-7; for neuralgia and tonsillitis, an av. for the 9 years, 1879-87; for other diseases, and for the average line, an av. for the 11 years, 1877-87.

TABLE 2.—CONTINUED.—Diseases in the Southwestern and Southern Central Divisions of the State, for the years 1877-87, and by Months in 1888.—Indicating what Per Cent of the Weekly Reports Received Stated the Presence of the Diseases Named.\*

Diseases.	1888-†	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
AV. for Tab. Dis. Rep Pres...	28	27	26	31	36	35	32	34	28	31	28	26	25
Brain, Inflammation of.....	4	6	0	5	6	7	5	0	6	2	11	8	8
Bowels, Inflammation of.....	10	14	6	5	13	4	15	20	13	23	24	15	14
Bronchitis.....	53	47	34	58	66	64	51	37	29	36	30	47	51
Corebro-spinal Meningitis.....	2	0	3	0	3	0	0	0	0	0	0	0	0
Cholera Infantum.....	19	14	0	0	0	0	10	14	23	35	11	5	3
Cholera Morbus.....	15	19	6	3	0	0	15	20	48	59	41	13	5
Consumption, Pulmonary.....	71	64	50	53	59	57	76	74	74	68	78	58	51
Croup, Membranous.....	4	3	0	0	0	0	2	0	0	2	0	8	14
Diphtheria.....	13	6	3	5	6	18	7	0	13	11	3	2	0
Diarrhea.....	38	36	19	13	25	14	29	23	71	82	70	36	31
Dysentery.....	14	17	0	3	9	7	7	3	32	50	49	19	13
Erysipelas.....	22	25	34	32	34	25	37	3	23	16	15	23	22
Fever, Intermittent.....	77	59	50	58	59	57	59	60	71	64	65	53	51
Fever, Remittent.....	48	45	34	37	38	43	46	40	45	64	59	51	38
Fever, Typhoid (Enteric).....	6	8	3	0	0	4	10	11	10	9	16	21	3
Fever, Typho-malarial.....	21	34	38	26	19	18	22	34	23	43	49	51	36
Influenza.....	43	32	41	42	53	50	27	40	3	18	22	25	33
Kidney, Inflammation of.....	14	16	13	11	13	18	14	16	16	14	9	28	19
Measles.....	10	22	13	24	47	50	71	51	13	5	0	2	5
Neuralgia.....	74	66	63	68	88	79	59	69	77	64	54	60	67
Phlegmon.....	19	28	34	34	32	10	23	6	14	3	15	15	24
Pneumonia.....	31	40	56	71	69	64	56	37	13	18	16	17	36
Puerperal Fever.....	3	1	3	0	6	4	0	0	6	0	0	0	0
Rheumatism.....	75	70	78	92	94	71	78	91	68	57	70	75	69
Scarlatina.....	13	8	25	16	3	18	15	9	0	11	5	0	3
Small-pox.....	0	7	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis.....	45	43	41	61	69	64	34	17	10	16	19	19	28
Whooping-cough.....	15	15	34	34	25	39	32	11	6	0	8	2	3

\*†, d. See page 99. ‡ Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the years 1880-87; for neuralgia and tonsillitis, an average for the 3 years 1870-87; for other diseases and, for average line an average for the 11 years 1877-87.

TABLE 2.—CONTINUED.—Diseases in the Southeastern Division of the State, for the Years 1877-87, and by Months in 1888, Indicating what Per Cent of the Weekly Reports Received Stated the Presence of the Diseases Named.\*

Diseases.	1877-87, †	1888 †	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for Tab. Dis. Rep. Pres.	35	26	29	30	29	30	28	26	26	30	29	27	26	32
Brain, Inflammation of.....	15	10	16	13	8	9	10	10	4	11	8	7	10	17
Bowels, Inflammation of.....	22	13	14	9	6	19	30	15	20	15	18	10	6	9
Bronchitis.....	67	73	77	86	88	83	72	63	57	48	63	72	79	87
Cerebro-Spinal Meningitis.....	8	2	0	1	2	15	0	0	2	0	2	0	6	2
Cholera Infantum.....	16	10	0	0	0	0	0	8	24	37	45	7	0	0
Cholera Morbus.....	23	16	2	0	0	6	8	15	35	53	41	19	8	0
Consumption, Pulmonary.....	79	64	75	57	48	59	63	69	69	69	59	62	67	67
Croup, Membranous.....	13	7	11	13	12	19	12	6	2	0	2	3	0	2
Diphtheria.....	30	16	27	19	15	19	17	10	8	15	14	12	19	17
Diarrhea.....	52	45	25	39	42	35	40	48	57	76	67	50	33	26
Dysentery.....	26	15	2	4	2	4	10	8	22	39	53	28	8	4
Erysipelas.....	33	35	27	44	38	39	33	40	37	34	24	33	29	39
Fever, Intermittent.....	68	42	34	41	35	57	42	35	55	50	51	36	33	37
Fever, Remittent.....	43	29	27	26	27	20	27	27	29	37	41	33	29	24
Fever, Typhoid (Enteric).....	24	18	14	16	13	9	8	8	12	32	24	24	25	24
Fever, Typho-Malarial.....	24	10	0	9	6	6	3	15	10	13	20	26	8	11
Influenza.....	42	30	39	49	44	39	32	13	8	8	18	26	31	46
Kidney, Inflammation of.....	24	34	21	33	31	33	37	42	31	37	31	31	35	43
Measles.....	18	17	23	37	29	37	22	23	12	8	2	3	2	0
Neuralgia.....	58	50	52	53	58	48	51	50	52	45	51	45	42	52
Pleuritis.....	19	21	29	25	25	20	13	13	12	15	14	21	23	28
Pneumonia.....	42	27	32	46	37	37	33	21	14	15	14	12	10	0
Puerperal Fever.....	10	6	7	6	12	4	8	6	4	3	2	12	10	0
Rheumatism.....	73	69	82	79	79	74	70	65	49	55	59	67	73	74
Scarlatina.....	27	16	23	11	19	19	18	15	12	8	12	19	21	22
Small-pox.....	36	2	4	7	2	0	1	0	0	0	0	0	2	0
Tonsillitis.....	48	46	59	51	62	63	50	38	27	19	33	36	48	63
Whooping-cough.....	28	13	13	11	15	13	17	8	31	18	4	9	6	9

\*†, d. See page 98. † Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 8 years 1880-87; for neuralgia, and tonsillitis an average for the 9 years 1879-87; for other diseases and for average line an average for the 11 years 1877-87.

TABLE 4.—A Summary for the Year 1888, relative to Diseases in each of the Eleven Divisions of the State, indicating the prevalence as regards both Time and Area.

Diseases.	Upper Peninsula Div.*					Northwestern Div.*					Northern Div.*					Northeastern Div.*					Northern Central Div.*				
	Per Cent of Observers Reporting Presence of, b	Av. Per Cent of Weeks Reported Present, c	Per Cent of Reports Stated Present, c	Av. Order of Prevalence where Present, e		Per Cent of Observers Reporting Presence of, b	Av. Per Cent of Weeks Reported Present, c	Per Cent of Reports Stated Present, c	Av. Order of Prevalence where Present, e		Per Cent of Observers Reporting Presence of, b	Av. Per Cent of Weeks Reported Present, c	Per Cent of Reports Stated Present, c	Av. Order of Prevalence where Present, e		Per Cent of Observers Reporting Presence of, b	Av. Per Cent of Weeks Reported Present, c	Per Cent of Reports Stated Present, c	Av. Order of Prevalence where Present, e		Per Cent of Observers Reporting Presence of, b	Av. Per Cent of Weeks Reported Present, c	Per Cent of Reports Stated Present, c	Av. Order of Prevalence where Present, e	
Average for Tabulated Diseases Reported Present....	41	26	61	2.6		38	63	24	4.4		27	61	17	3.2		36	63	23	2.8		31	58	19	2.8	
Brain, Inflammation of.....	23	14	58	2.8		15	30	4	3.2		9	25	2	3.7		5	24	1	3.5		8	28	1	3.0	
Bowels, Inflammation of.....	41	20	91	2.9		24	73	53	4.0		22	38	13	4.2		34	76	12	3.4		21	45	20	2.0	
Bronchitis.....	15	88	91	2.7		7	0	0	4.0		47	79	80	3.2		91	76	69	3.1		45	54	23	2.0	
Cerebro-spinal Meningitis.....	25	16	43	2.7		0	0	0	3.9		26	62	17	3.3		5	25	11	3.3		13	36	4	4.0	
Cholera Infantum.....	49	67	57	2.5		24	53	13	4.7		47	79	39	3.8		18	56	11	3.8		17	36	6	3.7	
Cholera Morbus.....	67	51	75	2.9		62	57	50	6.7		47	79	39	3.8		50	73	35	3.0		31	52	1	3.3	
Consumption, Pulmonary.....	23	46	46	2.6		6	22	1	8.3		6	25	1	3.7		7	33	2	3.0		4	63	3	4.5	
Croup, Membranous.....	25	13	63	2.1		12	35	4	8.3		6	25	1	3.7		5	33	2	3.0		4	63	3	3.5	
Diphtheria.....	82	73	73	2.8		21	56	36	3.0		29	66	21	3.4		5	33	2	3.0		4	63	3	3.5	
Dysentery.....	38	44	52	2.3		21	50	10	4.4		35	67	25	3.1		36	50	40	2.8		46	50	6	3.1	
Erysipelas.....	44	23	30	2.8		40	18	4	4.3		47	85	42	3.5		3	58	51	2.8		2	74	34	3.4	
Fever, Intermittent.....	23	14	37	2.3		53	39	27	2.7		18	56	11	3.4		6	78	5	2.8		44	56	21	3.1	
Fever, Remittent.....	13	38	38	1.9		62	68	41	4.1		15	41	7	3.4		16	53	0	2.8		33	44	19	2.1	
Fever, Typhoid (Enteric).....	25	61	51	2.3		32	64	24	5.2		24	59	7	3.4		12	35	35	2.0		44	56	34	1.8	
Fever, Typho-malarial.....	10	35	4	2.5		9	92	8	3.3		26	70	19	3.0		14	35	0	2.0		8	43	14	3.4	
Influenza.....	28	15	25	2.0		41	28	28	3.9		15	36	6	3.6		10	35	57	4.2		33	43	8	3.5	
Kidney, Inflammation of.....	44	26	56	3.0		35	29	10	4.5		36	55	12	3.6		10	50	10	3.0		21	55	18	2.0	
Malaria.....	34	18	23	2.3		12	60	6	4.5		24	48	11	2.5		41	68	56	2.4		25	50	44	2.5	
Measles.....	82	66	66	2.5		85	70	60	4.0		53	73	44	4.3		71	73	28	2.5		50	50	41	2.0	
Pleuritis.....	36	47	36	2.9		32	45	14	5.0		29	62	19	4.3		18	35	6	4.3		54	41	33	3.7	
Pneumonia.....	49	28	57	2.9		62	57	35	7.2		21	37	8	3.5		9	50	24	3.0		59	33	53	2.7	
Puerperal Fever.....	20	40	47	2.6		18	29	63	4.0		62	75	48	4.1		2	50	2	2.6		41	53	41	2.5	
Rheumatism.....	85	67	57	2.7		79	62	4	8.0		12	50	6	2.5		2	77	57	2.0		73	40	7	4.3	
Scarlatina.....	15	43	0	3.3		0	68	15	8.0		0	25	1	2.0		0	62	0	2.0		0	40	0	4.0	
Small-pox.....	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0	
Tonsillitis.....	84	61	52	2.7		74	64	48	4.1		47	54	20	2.9		72	62	2	3.1		63	69	44	3.1	
Whooping-cough.....	30	16	51	2.5		15	63	9	3.4		24	59	14	3.0		27	71	21	2.1		15	98	5	4.6	

\* For counties in each division see Exhibit L, page 85. b, c, d, e. See foot-notes with these marks in Table 2, page 99.  
 † This page includes the five Divisions of the State from which the fewest Weekly Reports were received.

TABLE 4.—CONTINUED.<sup>†</sup>

Diseases.	Western Division.*					Bay and Eastern.*					Central Division.*					Southwestern Div.*					S. Central Div.*					Southeastern Div.*				
	Per Cent of Observers Reporting Presence of	Av. Per Cent of Weeks Reported Present where	Per Cent of Reports Stated	Av. Order of Prevalence where Present.	Per Cent of Observers Reporting Presence of	Av. Per Cent of Weeks Reported Present where	Per Cent of Reports Stated	Av. Order of Prevalence where Present.	Per Cent of Observers Reporting Presence of	Av. Per Cent of Weeks Reported Present where	Per Cent of Reports Stated	Av. Order of Prevalence where Present.	Per Cent of Observers Reporting Presence of	Av. Per Cent of Weeks Reported Present where	Per Cent of Reports Stated	Av. Order of Prevalence where Present.	Per Cent of Observers Reporting Presence of	Av. Per Cent of Weeks Reported Present where	Per Cent of Reports Stated	Av. Order of Prevalence where Present.	Per Cent of Observers Reporting Presence of	Av. Per Cent of Weeks Reported Present where	Per Cent of Reports Stated	Av. Order of Prevalence where Present.						
Average for Tabulated Diseases Reported Present.....	34	64	22	3.7	36	66	24	3.6	34	63	22	3.1	38	69	27	3.7	38	68	26	3.5	39	67	26	3.5						
Brain, Inflammation of.....	10	38	4	5.4	11	44	5	6.7	16	33	5	4.4	14	27	6	7.7	20	33	3	6.4	16	66	10	12.6						
Bowels, Inflammation of.....	22	88	8	4.8	34	53	19	5.1	33	51	17	4.9	27	53	14	4.2	24	54	3	5.1	31	43	13	16.6						
Cerebro-spinal Meningitis.....	5	85	31	3.0	71	89	61	2.7	70	72	51	3.5	61	71	47	3.6	77	76	59	2.6	86	83	73	2.2						
Cholera Infantum.....	1	25	0.3	8.1	1	35	3	6.1	1	53	6	4.5	1	64	0.4	5.0	1	5	5	3.9	1	88	3	5.5						
Cholera Morbus.....	10	24	2	4.8	23	60	14	4.5	16	46	14	3.3	24	25	14	4.3	21	55	12	4.2	19	52	10	4.7						
Croup, Consumption, Pulmonary.....	18	38	7	4.8	30	58	17	3.7	28	50	14	3.2	31	60	19	4.4	29	50	15	3.5	29	55	16	4.2						
Croup, Membranous.....	51	78	40	4.6	50	90	46	3.3	52	82	43	3.6	71	89	61	4.4	59	89	51	4.1	73	86	64	2.3						
Diphtheria.....	18	35	6	4.3	9	32	3	4.9	7	29	2	2.8	7	48	3	6.6	6	34	2	4.7	14	49	7	8.5						
Dysentery.....	20	53	6	4.3	7	34	3	6.0	10	47	5	3.7	14	39	6	5.6	16	49	8	5.1	37	60	16	5.5						
Erysipelas.....	66	59	39	3.4	55	70	39	3.2	63	63	40	2.9	51	68	36	3.2	59	70	41	2.8	61	74	45	3.8						
Fever, Intermittent.....	29	51	15	3.4	26	59	15	4.8	28	49	14	3.6	31	55	17	4.4	34	61	21	4.6	51	68	35	4.6						
Fever, Remittent.....	40	50	20	3.5	45	50	23	4.3	36	50	18	3.3	40	59	25	4.0	46	53	24	3.6	61	65	33	5.5						
Fever, Typhoid (Enteric).....	72	85	61	2.2	54	71	39	2.7	71	74	53	2.3	70	81	59	2.4	53	75	40	2.8	64	66	42	3.9						
Fever, Typho-malarial.....	55	56	31	4.0	45	68	31	3.5	61	67	43	2.5	52	84	45	2.9	61	73	45	3.4	64	65	29	2.9						
Influenza.....	21	62	13	4.2	14	51	7	3.8	14	51	8	3.3	16	47	8	4.4	15	62	9	3.9	23	74	18	6.4						
Kidney, Inflammation of.....	48	74	35	2.6	36	57	21	3.8	22	57	13	3.0	45	71	34	4.0	44	62	14	3.8	58	80	30	3.0						
Measles.....	48	74	35	2.6	36	57	21	3.8	22	57	13	3.0	45	71	34	4.0	44	62	14	3.8	58	80	30	3.0						
Neuritis.....	48	74	35	2.6	36	57	21	3.8	22	57	13	3.0	45	71	34	4.0	44	62	14	3.8	58	80	30	3.0						
Neuralgia.....	48	74	35	2.6	36	57	21	3.8	22	57	13	3.0	45	71	34	4.0	44	62	14	3.8	58	80	30	3.0						
Parotitis.....	43	66	16	4.4	44	62	26	4.4	38	54	21	3.1	37	61	19	4.5	59	60	30	3.2	68	70	33	3.8						
Pneumonia.....	45	62	17	4.3	45	62	26	4.4	38	54	21	3.1	37	61	19	4.5	59	60	30	3.2	68	70	33	3.8						
Puerperal Fever.....	18	44	7	3.9	10	32	3	4.9	9	24	2	2.6	13	38	1	5.3	13	38	1	4.8	14	45	6	6.3						
Rheumatism.....	13	59	8	3.5	14	46	6	3.9	19	49	6	2.8	16	50	8	4.6	18	50	8	3.0	41	62	16	6.0						
Scarlatina.....	13	59	8	3.5	14	46	6	3.9	19	49	6	2.8	16	50	8	4.6	18	50	8	3.0	41	62	16	6.0						
Small-pox.....	0	0	0	0	0	0	0	0	1	63	36	4.5	0	0	0	0	0	0	0	0	28	34	27	2.1						
Tonsillitis.....	67	62	42	3.7	54	65	35	3.8	60	69	36	3.5	57	71	35	4.0	69	66	45	3.3	65	67	46	2.9						
Whooping-cough.....	16	52	8	4.1	20	50	11	4.4	8	63	5	2.8	21	71	15	3.4	9	54	5	3.5	23	53	13	5.7						

\* For counties in each division see Exhibit 1, page 85. b, c, d, e. See foot-notes with these marks in Table 2, page 99.  
† This page includes the six Divisions of the State from which the most Weekly Reports were received.

## WHAT DISEASES CAUSE MOST SICKNESS.

This is shown in Exhibit VI., in this Report, and in similar exhibits in previous Reports. The question is differently answered in different years. For many years after the compilation of weekly reports was begun, intermittent fever appeared to be the leading cause of sickness in Michigan. In 1884 neuralgia headed the list, with rheumatism second and intermittent fever third. In 1885 neuralgia again headed the list, intermittent fever second, rheumatism third. In 1886 rheumatism headed the list, neuralgia second, bronchitis third, and intermittent fever fourth. In 1887 rheumatism, neuralgia, bronchitis, and consumption of the lungs headed the list, in the order named. In 1888 rheumatism, neuralgia, bronchitis and intermittent fever head the list.

Nearly the same diseases appear above the average line each year. Pneumonia has appeared in this exhibit tenth in order for nine years in succession. Some of the diseases of minor importance vary considerably in their order. Whooping-cough, for example, in 1881 and 1883 was nineteenth in order, and rose to twelfth in order in 1886, and dropped to nineteenth in 1887, and to twentieth in 1888.

Exhibit VII. supplies data relative to what diseases caused most sickness in 1887 in each of several geographical divisions of Michigan. It may be seen that there is evidence that there are very great differences in the different parts of the State. Further evidence is very desirable, however, in order to reach conclusions on this important subject. The exhibit will be found of great interest to those who study it carefully, and in connection with previous reports.



EXHIBIT VI.—*Diseases from which there seems to have been the Most Sickness in Michigan in 1888, as indicated by the Per Cent of Weekly Reports Stating Presence of the Diseases, as studied in connection with the Average Order of Prevalence of said Diseases when Reported Present; also Order, Per Cent of Reports, and Average Order for the same Diseases in 1887, 1886, 1885, and 1884.*

		1888.				1887.				1886.				1885.				1884.			
Less than said Average.	Order.*	Diseases in Order of Apparent Amount of Sickness in 1888, Most Prevalent Disease First.	Per Cent of Reports Stating Prevalence of, d		Av. Order of Prevalence when Present. <i>e</i>	Order.*	Per Cent of Reports Stating Prevalence of, d		Av. Order of Prevalence when Present. <i>e</i>	Order.*	Per Cent of Reports Stating Prevalence of, d		Av. Order of Prevalence when Present. <i>e</i>	Order.*	Per Cent of Reports Stating Prevalence of, d		Av. Order of Prevalence when Present. <i>e</i>	Order.*	Per Cent of Reports Stating Prevalence of, d		Av. Order of Prevalence when Present. <i>e</i>
More Sickness than Average for 28 Diseases in 1888.	1	Rheumatism .....	66	3.0		1	69	3.2		1	70	3.2		3	63	3.2		2	70	3.6	
	2	Neuralgia.....	62	2.7		2	67	2.8		2	67	2.8		1	68	2.8		1	70	3.3	
	3	Bronchitis.....	59	2.7		3	55	3.0		3	56	3.0		4	56	3.1		4	61	3.2	
	4	Intermittent fever.....	45	2.6		5	48	2.8		5	54	2.6		2	59	2.4		3	65	2.5	
	5	Consumption, Pul.....	49	3.6		4	51	3.7		4	55	3.9		5	55	4.0		5	63	4.3	
	6	Diarrhea.....	41	3.0		6	48	3.0		6	45	3.2		7	46	3.3		6	52	3.3	
	7	Tonsillitis.....	41	3.4		7	47	3.4		7	49	3.4		6	50	3.5		7	50	3.7	
	8	Influenza.....	32	2.7		8	33	3.0		8	35	2.7		8	34	2.9		9	41	3.3	
	9	Remittent fever.....	34	3.1		9	32	3.4		9	34	3.3		9	36	3.2		8	44	3.3	
	10	Pneumonia.....	30	4.0		10	28	4.3		10	27	4.0		10	27	4.4		10	29	4.5	
	(11)	Av. for 28 diseases.....†	24	3.5		(11)	25	3.7		(10)	26	3.7		(10)	26	3.8		(10)*	29	4.2	
	11	Erysipelas .....	24	4.4		11	24	4.7		12	23	4.5		11	24	4.6		12	26	5.2	
	12	Measles.....	16	3.2		16	14	3.6		22	6	5.0		25	5	6.4		23	10	5.2	
	13	Dysentery .....	17	3.8		13	19	4.3		14	17	4.5		19	15	5.0		14	23	5.0	
	14	Typho-malarial fever....	15	3.6		15	16	4.1		15	16	4.2		16	16	4.4		17	20	4.6	
	15	Cholera Morbus .....	15	3.7		12	19	3.8		13	17	4.2		15	17	4.5		15	22	4.9	

\* Judging from the per cent of reports which stated presence of the diseases, in connection with the order of prevalence when present.

† For 1884, 1885, 1886 and 1887 the average is for 27 diseases.

d This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from all observers in the State. It combines and states in a general way, an idea of the time a disease was prevalent, with an idea of the area of its prevalence.

e The disease having the greatest number of cases was to be marked 1, in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals of the Order of Prevalence columns, in Table 3 (omitted in this report), by the number of men who reported the disease present. The column is, therefore, an average not for all the localities represented, but only for those at which the given disease was reported present. The numbers in the "Average" lines for this column are found by dividing the sum of the totals in the Order of Prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of men who reported the different diseases present, thus counting each man once for every disease he reported present. As a rule, small numbers in this column indicate the large prevalence of the disease, and vice versa; but the greater the number of diseases reported present by each observer, from week to week, the greater will be the "average" in this column.

EXHIBIT VII.—*In each of Eleven Geographical Divisions\* of the State, the Fifteen Diseases from which there seems to have been the Greatest Amount of Sickness in 1888, as indicated by the Per Cent of Weekly Reports Stating Presence of each of 28 Leading Diseases, when Studied in connection with the Average Order of Prevalence of said diseases when reported present.*

	Order.†	Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.	Per Cent of Reports Stating Presence of, d		Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.	Per Cent of Reports Stating Presence of, d		Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.	Per Cent of Reports Stating Presence of, d	
			Av. Order of Prevalence when Pres. e			Av. Order of Prevalence when Pres. e			Av. Order of Prevalence when Pres. e	
More Sickness than Average for 28 Diseases.		UPPER PENINSULA DIV.*			NORTHWESTERN DIV.*			NORTHERN DIVISION.*		
	1	Bronchitis.....	88	1.6	Neuralgia.....	60	4.0	Rheumatism.....	48	2.2
	2	Diarrhea.....	62	2.1	Rheumatism.....	62	4.4	Neuralgia.....	44	2.5
	3	Neuralgia.....	56	2.5	Intermittent Fever	39	2.7	Erysipelas.....	42	3.1
	4	Rheumatism.....	57	2.6	Bronchitis.....	53	4.0	Bronchitis.....	39	3.2
	5	Tonsillitis.....	52	2.7	Tonsillitis.....	48	4.1	Consumption, Pul.	39	3.4
	6	Consumption, Pul.	51	2.9	Diarrhea.....	36	3.0	Diarrhea.....	21	2.4
	7	Influenza.....	15	2.0	Remittent Fever...	41	4.1	Tonsillitis.....	26	2.9
	8	Cholera Morbus....	28	2.5	Consumption, Pul.	59	6.7	Dysentery.....	25	3.1
	9	Measles.....	18	2.3	Influenza.....	28	3.9	Measles.....	11	2.5
	10	Remittent Fever...	5	1.9	Pneumonia.....	35	4.7	Typho-mal. Fever..	19	3.0
	(11)	Average.....	26	2.6	.....	.....	.....	.....	.....	.....
	11	Intermittent Fever.	14	2.3	Inflam. of Kidney..	10	3.1	Whooping-cough...	14	3.0
	(12)	.....	.....	.....	Average.....	24	4.4	Average.....	17	3.2
Less.	12	Cholera Infantum..	16	2.5	Typho-mal. Fever..	8	3.3	Cholera Infantum..	17	3.3
	13	Whooping-cough...	16	2.5	Whooping-cough...	9	3.4	Scarlet Fever.....	6	2.8
	14	Pneumonia.....	28	2.9	Erysipelas.....	18	4.3	Intermittent Fever.	11	3.5
	15	Inflam. of Kidney..	26	3.0	Cholera Infantum..	13	3.9	Remittent Fever...	7	3.4
More Sickness than Average for 28 Diseases.		NORTHEASTERN DIV.*			WESTERN DIVISION.*			NORTHERN CEN. DIV.*		
	1	Influenza.....	57	1.7	Intermittent Fever.	61	2.2	Intermittent Fever	56	2.1
	2	Bronchitis.....	69	2.4	Neuralgia.....	63	2.8	Bronchitis.....	54	2.3
	3	Diarrhea.....	54	2.3	Rheumatism.....	61	3.6	Rheumatism.....	53	2.5
	4	Rheumatism.....	57	2.5	Bronchitis.....	49	3.1	Remittent Fever...	34	1.9
	5	Neuralgia.....	56	2.5	Influenza.....	35	2.5	Neuralgia.....	44	2.5
	6	Intermittent Fever	51	2.8	Diarrhea.....	39	3.4	Tonsillitis.....	44	3.1
	7	Tonsillitis.....	46	3.1	Tonsillitis.....	42	3.7	Measles.....	18	2.0
	8	Measles.....	28	2.4	Consumption, Pul.	40	4.6	Diarrhea.....	28	2.6
	9	Whooping-cough...	20	2.1	Remittent Fever...	31	4.0	Pneumonia.....	33	3.2
	(10)	.....	.....	.....	Average.....	22	3.7	.....	.....	.....
	10	Consumption, Pul..	37	3.0	Pneumonia.....	28	4.4	Inflam. of Kidney..	8	2.0
	(11)	Average.....	23	2.8	.....	.....	.....	.....	.....	.....
	11	Diphtheria.....	2	2.0	Dysentery.....	15	3.4	Typhoid Fev. (ent.)	3	1.8
	12	Scarlet Fever.....	2	2.0	Typhoid Fev. (ent.)	8	3.2	Inflam. of Bowels..	5	2.0
	(13)	.....	.....	.....	.....	.....	.....	Average.....	19	2.8
Less.	13	Typhoid Fev., (ent.)	.05	2.0	Measles.....	11	3.7	Inflam. of Brain....	2	2.0
	14	Dysentery.....	19	2.8	Scarlet Fever.....	8	3.5	Erysipelas.....	23	3.1
	15	Cholera Infantum..	11	2.8	Pleuritis.....	16	4.4	Consumption, Pul..	17	3.3

\* For counties in each division see Exhibit I., page 85.

† Judging from the per cent of reports in connection with the "average order of prevalence when present." d, e. Footnotes with these marks are on page 99.

## EXHIBIT VII.—CONTINUED.

	Order, †	Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.		Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.		Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.	
		Per Cent of Reports Stating Presence of, d	Av. Order of Preva- lence when Pres.e	Per Cent of Reports Stating Presence of, d	Av. Order of Preva- lence when Pres.e	Per Cent of Reports Stating Presence of, d	Av. Order of Preva- lence when Pres.e
More Sickness than Av. for 28 Diseases.		BAY AND EAST'N DIV.*		CENTRAL DIVISION.*		SOUTHWESTERN DIV.*	
	1	Neuralgia.....	62 2.6	Neuralgia.....	70 2.4	Rheumatism.....	76 2.8
	2	Bronchitis.....	61 2.7	Intermittent Fever.....	53 2.3	Neuralgia.....	66 2.8
	3	Rheumatism.....	65 3.0	Rheumatism.....	63 2.8	Intermittent Fever.....	59 2.4
	4	Intermittent Fever.....	39 2.7	Remittent Fever.....	43 2.5	Remittent Fever.....	45 2.9
	5	Consumption, Pul.....	46 3.2	Influenza.....	39 2.4	Consumption, Pul.....	64 4.4
	6	Diarrhea.....	39 3.2	Bronchitis.....	51 3.1	Bronchitis.....	47 3.6
	7	Influenza.....	34 2.9	Diarrhea.....	40 2.9	Diarrhea.....	36 3.2
	8	Remittent Fever.....	31 3.5	Measles.....	14 2.4	Influenza.....	32 3.0
	9	Tonsillitis.....	35 3.8	Consumption, Pul.....	43 3.6	Measles.....	22 2.8
	10	Pneumonia.....	31 4.0	Tonsillitis.....	36 3.4	Pneumonia.....	40 4.1
	(11)	Average.....	24 3.6	Average.....	22 3.1	.....	.....
	11	Measles.....	16 3.4	Typho-mal. Fever.....	13 3.0	Typho-mal. Fever.....	34 4.0
	12	Typho-mal. Fever.....	21 3.8	Whooping-cough.....	5 2.8	Tonsillitis.....	33 4.0
	(13)	.....	.....	.....	.....	Average.....	27 3.7
Less.	13	Cholera Morbus.....	17 3.7	Scarlet Fever.....	9 3.0	Whooping-cough.....	15 3.4
	14	Pleuritis.....	26 4.4	Membranous Croup.....	2 2.8	Pleuritis.....	19 4.5
	15	Erysipelas.....	23 4.3	Cholera Morbus.....	14 3.2	Dysentery.....	17 4.4
More Sickness than Av. for 28 Diseases.		SOUTHERN-CENTRAL DIV.*		SOUTHEASTERN DIVISION.*			
	1	Rheumatism.....	76 3.0	Bronchitis.....	.....	.....	73 2.2
	2	Neuralgia.....	69 2.7	Rheumatism.....	.....	.....	69 3.2
	3	Bronchitis.....	59 2.6	Consumption, Pulmonary.....	.....	.....	64 2.3
	4	Influenza.....	43 2.4	Neuralgia.....	.....	.....	50 3.3
	5	Diarrhea.....	41 2.8	Tonsillitis.....	.....	.....	46 2.9
	6	Intermittent Fever.....	40 2.8	Diarrhea.....	.....	.....	45 3.8
	7	Tonsillitis.....	45 3.3	Intermittent Fever.....	.....	.....	42 3.3
	8	Remittent Fever.....	45 3.4	Remittent Fever.....	.....	.....	29 2.9
	9	Consumption, Pul.....	51 4.1	Influenza.....	.....	.....	30 3.6
	10	Pneumonia.....	38 3.7	Erysipelas.....	.....	.....	35 5.5
	(11)	Average.....	26 3.5	.....	.....	.....	.....
	11	Measles.....	15 3.0	Inflammation of Kidney.....	.....	.....	34 5.9
	(12)	.....	.....	Average.....	.....	.....	26 4.3
	12	Dysentery.....	21 3.6	Pneumonia.....	.....	.....	27 5.4
	13	Cholera Morbus.....	15 3.5	Cholera Morbus.....	.....	.....	16 4.2
	14	Pleuritis.....	20 4.2	Typho-malarial Fever.....	.....	.....	10 3.0
	15	Typho-mal. Fever.....	14 3.9	Dysentery.....	.....	.....	15 4.6

\* For counties in each division see Exhibit I., page 85.

† Judging from the per cent of reports in connection with the "average order of prevalence where present." d, e. See foot-notes with these marks on page 96.

EXHIBIT VIII.—Names of Stations where were made the Observations of Meteorological Conditions used in Exhibit X., and following Exhibits, relative to Sickness and Meteorological Conditions in 1888, also the Temperature, Humidity, Cloudiness, Ozone, Velocity of Wind and Atmospheric Pressure, at each Station for which Observations of the given condition are included in the summary statements relative to that condition in said exhibit.

Stations.* (Those of the U. S. Signal Service in Italics.)	Temperature.		Humidity.		Per Cent of Cloudiness.	Ozone.		Wind, Av. Velocity.	Atmospheric Pressure.		
	Av. Daily Range.	Average.	Relative.	Absolute.		Day.	Night.		Range.		Average.
									Monthly.	Av. Daily.	
Number of Stations Included in Average.....	15	13	9	9	11	9	9	7	12	12	12
Average.....	17.42	45.03	77	3.31	57	4.20	4.29	9.8	.916	.207	29.158
<i>Marquette</i> .....	15.58	.....	.....	.....	.....	.....	.....	8.3	.....	.....	.....
Gulliver Lake.....	20.33	38.58	83	2.87	55	.....	.....	.....	1.012	.216	29.319
Traverse City.....	21.26	42.60	80	3.18	62	6.71	6.68	.....	.908	.219	29.349
<i>Alpena</i> .....	15.22	.....	.....	.....	.....	.....	.....	9.2	.....	.....	.....
Harrisville.....	.....	.....	.....	.....	58	4.36	4.71	.....	.950	.240	29.336
<i>Grand Haven</i> .....	13.94	.....	.....	.....	.....	.....	.....	11.3	.....	.....	.....
Port Austin.....	15.14	43.73	.....	.....	.....	4.19	4.84	.....	.894	.228	29.358
<i>Port Huron</i> .....	16.14	.....	.....	.....	.....	.....	.....	11.3	.....	.....	.....
Thornville.....	15.87	45.82	79	3.45	51	3.49	3.92	.....	.917	.209	28.964
Agricultural College.....	19.76	45.03	76	3.26	58	.....	.....	.....	.918	.195	29.108
Lansing, S. B. of H.....	19.10	45.49	71	3.21	59	3.45	3.16	9.6	.906	.201	29.092
Otsego.....	.....	45.69	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ann Arbor.....	18.16	45.67	76	3.41	61	4.02	3.79	8.9	.904	.201	29.019
Battle Creek.....	17.38	48.31	.....	.....	53	.....	.....	.....	.871	.179	29.127
Kalamazoo.....	17.86	46.35	77	3.42	58	3.28	3.44	.....	.899	.198	29.037
Marshall.....	19.75	48.19	76	3.63	55	3.84	3.82	.....	.892	.195	29.051
Tecumseh.....	.....	44.81	.....	.....	.....	.....	.....	.....	.....	.....	.....
Birmingham.....	.....	45.17	76	3.34	59	4.47	4.27	.....	.917	.204	29.134
<i>Detroit</i> .....	15.90	.....	.....	.....	.....	.....	.....	9.7	.....	.....	.....

\* Observations of range of temperature were made with registering thermometers read and set at 10 P. M. at the Signal Service Stations, at 9 P. M. at Ann Arbor and at 7 A. M. at other stations. For the ozone observations, the test-paper was exposed from 7 A. M. to 2 P. M. for the day observations, and from 9 P. M. to 7 A. M. for the night observations. The velocity of wind was recorded by registering anemometers. These subjects are treated by months in 1888 and for previous years, in an article on Meteorological Conditions in Michigan in 1888, on pages 1-77 of this Report.

NOTE.—At the U. S. Signal Service Stations, the observations of average temperature, humidity, cloudiness, ozone and atmospheric pressure were made tri-daily for the first six months, and bi-daily for the last six months of 1888.

EXHIBIT IX.—Showing Comparisons between the Averages of certain Meteorological Conditions at Stations in Michigan in 1888, with those in preceding Years. (Abstracted from Exhibit 5, page 17; Exhibit 8, page 23; Exhibit 11, page 27; Exhibit 13, page 32; Exhibit 18, page 42; Exhibit 22, page 52; Exhibits 24 and 25, page 53; Exhibit 29, page 73; Exhibit 26, page 60.)

Meteorological Conditions.		Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average Temperature.....	In 1888 higher than Av. for 11 years, 1877-87.....							2.80	0.18	0.07			2.77	4.04
	Lower.....	.96	4.27	1.78	3.52	1.31	3.10				3.13	4.24		
Av. Daily Range of Temp.....	In 1888 more than Av. for 9 years, 1879-87.....							0.48	0.02	0.26	0.59			
	Less.....	0.86	1.24	0.40	0.29	0.73	2.98					2.97	1.24	2.09
Absolute Humidity.....	In 1888 more than Av. for 11 years, 1877-87.....			0.01				0.42					0.20	0.19
	Less.....	0.11	0.11		0.11	0.18	0.27		0.14	0.19	0.62	0.60		
Relative Humidity.....	In 1888 more than Av. for 10 years, 1878-87.....	1	9	7	7		3							
	Less.....					1		2	1	2	1	0	0	0
Rainfall.....	In 1888 more than Av. for 11 years, 1877-87.....				.12		.42							
	Less.....	6.96	0.18	0.94		0.41		1.20	1.49	1.04	0.87	0.86	0.36	0.88
Velocity of Wind.....	In 1888 more than average for 6 years, 1882-87.....	0.3			1.2	0.4		0.7		1.1	0.3	0.6		1.2
	Less.....		1.0	0.4			0.1		0.6				0.6	
Cloudiness.....	In 1888 more than Av. for 11 years, 1877-87.....	1	6	1			17		4	1		10		
	Less.....				1	5		4			6		4	4
Day Ozone.....	In 1888 more than Av. for 11 years, 1877-87.....	1.09	0.18	0.18	0.55	1.49	2.44	2.12	0.41	0.94	1.59	1.46	0.35	1.34
	Less.....													
Night Ozone.....	In 1888 more than Av. for 11 years, 1877-87.....	1.05			0.25	1.43	2.23	2.10	0.47	1.20	1.48	1.29	0.28	1.50
	Less.....		0.05	0.08										
Atmospheric Pressure.....	In 1888 greater than Av. for 11 years, 1877-87.....		.082		.050	.123			.046				.026	
	Less.....	.005		.072			.066	.046		.007	.024	.130		.042

## CLIMATE AND SICKNESS.\*

Exhibit X., page 119, (and similar exhibits in previous Reports) is an attempt to learn something of the relations of bronchitis to meteorological conditions, by noting whether each meteorological condition was above or below its average for the year, in months when more or in months when less bronchitis than the average for the year was reported. The months are arranged in order according to the prevalence of bronchitis; those months in which most bronchitis was reported being placed first in the column; those in which more bronchitis than the average was reported are placed above the average line, the others below that line. The meteorological conditions for each month are printed, in the proper columns, in the line for the month. The statements being thus arranged, it is easy to see whether the temperature, the velocity of the wind, or any other condition represented, was above its annual average in months when more than the average amount of bronchitis was reported, or *vice versa*.

That the comparisons may the more readily be held in mind, propositions have been made concerning the relations of bronchitis to meteorological conditions, grouping the conditions into two classes. The letters *a* and *b* in the Exhibit mark exceptions to these propositions. It is not supposed that the propositions are in every case true concerning every disease; but the propositions serve to bring out the evidence of the exhibit on the subject in question. This evidence is appreciated by noting the number and force of the exceptions to the propositions, and also whether the exception is explained by facts shown in other columns. A summary of the evidence is presented in Exhibit XXIV., near the close of this article.

Exhibits and propositions similar to those relative to bronchitis, but relating to other diseases, are given on following pages. The propositions are differently stated for the summer diseases (beginning with the exhibit on diarrhea) and for the winter diseases (beginning with that on bronchitis), but they are not changed to fit the individual diseases under each class.

## RELATIONS OF BRONCHITIS TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of bronchitis the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of bronchitis these conditions were less than the average for the year. In Exhibit X., page 119, the letter *a* marks exceptions to this proposition for the year 1888.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of bronchitis, the average daily temperature, and the absolute humidity of the atmosphere were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of bronchitis these conditions were **greater** than

\* The remarks under this head are applicable, also, by changing the name of the disease to diseases treated in Exhibits XII., XIV., XV., XVI., and XVII., on the following pages. The meteorological data are from places indicated in Exhibit VIII., page 114.

the average for the year. In Exhibit X, page 119, the letter *b* marks exceptions to this proposition for months in 1888.

PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to Proposition 2, it is true also that the quantity of vapor inhaled daily was less than the average, and the quantity exhaled daily in excess of that inhaled was greater than the average in months when more than the average per cent of reports stated presence of bronchitis; and that more vapor was inhaled and a less excess exhaled daily in months when the per cent of reports stating presence of bronchitis was less than the average.

Proposition 3 also holds true in relation to pneumonia, membranous croup, diphtheria, tonsilitis, influenza, scarlet fever, rheumatism, neuralgia, pleuritis and pulmonary consumption, treated in Exhibits XII., XIV., XV., XVI., and XVII., on following pages.

What per cent of weekly reports received in 1888 stated presence of bronchitis is graphically represented by months in Diagram 1, page 87.

The evidence of Exhibit X. confirms that of similar exhibits relating to bronchitis in previous years.

What per cent of the reports received stated presence of bronchitis by months in each of the years 1877-88; also the average for 1877-1887, and a comparison of 1888 with that average, are shown in Exhibit XI., page 118.

#### RELATIONS OF PNEUMONIA AND OTHER "COLD WEATHER" DISEASES TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when more than the average per cent of weekly reports stated the presence of pneumonia (or of membranous croup, diphtheria, tonsilitis, influenza, scarlet fever, rheumatism, neuralgia, pleuritis, or pulmonary consumption), the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere, were greater than the average for the year; and in months when less than the average per cent of the reports stated the presence of pneumonia (or of the other diseases named), these conditions were less than the average for the year. In exhibits XII.-XVII., on page 120 and the following pages, the letter *a* marks exceptions to this proposition for the year 1888.

PROPOSITION 2.—That in months when more than the average per cent of weekly reports stated the presence of pneumonia (or of membranous croup, diphtheria, tonsilitis, influenza, scarlet fever, rheumatism, neuralgia, pleuritis, or pulmonary consumption), the average daily temperature and the absolute humidity of the atmosphere were less than the average for the year; and in months when less than the average per cent of reports stated the presence of pneumonia (or of the other diseases named), these conditions were greater than the average for the year. In exhibits XII.-XVII., on page 120 and following pages, the letter *b* marks exceptions to this proposition for the year 1888.

What per cent of the weekly reports received in 1888 stated presence of pneumonia is graphically represented by months in Diagram 1, page 87. What per cent of weekly reports received stated presence of pneumonia, and of the other diseases mentioned in the two preceding propositions by months

in the years 1877-88, is stated in Exhibit XIII., page 122, where are also given an average for those years and a comparison of 1888 with that average.

From Exhibit XIII., it may be seen that pneumonia was considerably less in 1888 than the average for eleven years, 1877-87, and also less in each month in 1888, except May and June (June was the same), than for the corresponding months of the eleven years, 1877-1887.

The average temperature was slightly lower in 1888 than the average for the eleven years, 1877-87. It was also lower in each month of 1888, except in June, July, August, November and December, than the average in corresponding months in the eleven years, 1877-87.

The absolute humidity was less for the year and for each month of the year, except February, June, November and December than the average for the eleven years, 1877-87.

The relative humidity was more for the year and less for each month of the year, except in January, February, March and May, than the average for the eleven years, 1877-87.

The exact force of this evidence cannot be estimated, because of the change in method of reporting mentioned on a preceding page, but it can be held tentatively until the present method has been in operation long enough to settle the question.

**EXHIBIT XI.—SICKNESS FROM BRONCHITIS, 1877-87.—***By Year and Months for each of the Eleven Years 1877-87 and for 1888; Stating on what per cent of the Weekly Reports received Bronchitis was reported present, and comparing the Per Cents for 1888 with the Averages for corresponding months in those Years.*

Years, Etc.	Annual Av.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.
Average 11 years, 1877-87.....	61	76	76	76	70	60	52	43	41	48	54	65	70
1877.....	55	76	72	72	65	45	31	25	22	37	48	71	77
1878.....	64	77	75	74	71	65	56	41	45	55	60	73	81
1879.....	64	83	87	83	78	65	54	40	41	50	59	65	77
1880.....	64	81	84	82	68	59	57	44	45	46	57	67	72
1881.....	62	86	86	80	78	62	53	38	37	44	44	66	68
1882.....	65	73	70	75	74	70	62	51	44	57	59	71	71
1883.....	66	77	80	82	76	70	62	56	53	53	57	61	69
1884.....	61	71	71	71	65	59	56	49	47	50	56	69	70
1885.....	56	73	74	76	73	56	52	44	39	45	51	58	64
1886.....	56	71	69	71	65	57	45	40	37	41	51	61	65
1887.....	55	87	69	67	62	57	49	41	38	47	57	57	61
1888.....	59	63	76	74	68	63	55	41	39	49	59	59	65
In 1888 <b>Greater</b> than Av. 1877-87.....	---	---	---	---	---	3	3	---	---	1	5	---	---
In 1888 <b>Less</b> than Av. 1877-87.....	2	13	---	2	2	---	---	2	2	---	---	6	5



**EXHIBIT X.—BRONCHITIS.**—*Stating for the Year and for each Month of the Year 1888, what Per Cent of the Weekly Reports of Sickness stated Presence of Bronchitis, and what were the Meteorological Conditions as observed at Stations in Michigan.\**

BRONCHITIS.				Temperature. F.		Humidity of Air. Av. of 3 Daily Ob- servations.		Vapor In- haled and Ex- haled from the Air Pass- ages by one Person in 24 Hours. Troy Ounces.			Ozone— Relative Scale of 10°.		Atmospheric Pressure Inches, Reduced to 32° F.			
Months in Order of Great- est Per Cent of Weekly Reports Stating Pres- ence of.	Per Cent of Weekly Reports Stating Presence of.†	Av. Order of Prevalence Where Present,‡	Average Daily Range by Registering Thermometers.	Average of three Daily Ob- servations.	Relative—Per Cent of Saturation.	Absolute—Grains of Vapor in a Cubic Foot of Air.	Average Per Cent of Cloudiness.			Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles per Hour, by Anemometer.	Range.			
							Inhaled.	Exhaled in Ex- cess of that Inhaled ¶					Monthly and for Year.	Average Daily, by 3 Daily Observa- tions.**	Average Pressure.	
More than Av. Per Cen of Bronchitis.	Feb. ....	76	2.4	17.70	21.65	87	1.51	.94	10.74	64	a3.65	a3.97	10.1	1.609	.302	a29.129
	March....	74	2.5	17.73	25.89	84	1.67	1.04	10.64	58	a4.03	a4.27	11.4	1.062	.228	29.203
	April.....	68	2.4	18.70	42.81	a69	2.55	1.59	10.09	a47	4.75	4.98	10.6	1.003	.240	29.250
	Dec. ....	65	2.2	a11.28	30.73	83	1.92	1.20	10.48	73	4.57	5.05	12.0	.940	.223	a29.143
	Jan. ....	63	2.3	a15.28	15.93	90	1.25	.78	10.90	75	a3.52	a3.85	10.2	1.283	.332	29.278
	May.....	63	2.6	18.04	b53.40	a71	b3.69	2.31	9.37	64	5.57	5.53	a9.1	a.807	a.172	a29.065
Less than Av. Per Cent of Bronchitis.	Nov.....	59	2.5	a13.47	38.73	79	2.49	1.56	10.12	64	a3.61	a3.61	10.2	a.801	a.206	29.202
	Average.....	59	2.7	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158
	Oct.....	59	2.7	14.58	46.01	76	b3.05	1.91	9.77	a67	a4.33	a4.31	a10.1	a.933	a.217	29.070
	June ....	55	3.0	a21.11	68.03	70	5.71	3.57	8.11	43	a5.06	a5.09	8.6	.609	.137	29.069
	Sept.....	49	3.5	a20.33	58.20	74	4.30	2.69	8.99	40	a4.40	4.07	8.8	.886	.189	a29.174
	July.....	41	2.9	a20.68	70.95	71	5.95	3.72	7.96	45	3.15	3.04	7.3	.451	.105	a29.166
	Aug.....	39	3.8	a20.21	68.05	72	5.59	3.49	8.19	45	3.77	3.73	8.6	.603	.137	29.144

a An exception to the proposition that **more** than the average per cent of weekly reports stated presence of bronchitis in months when the meteorological condition named at the head of the column was **greater** than the average for the year; and **less** in months when the same condition was **less** than the average. See proposition 1, relating to bronchitis, page 116.

b An exception to the proposition that **more** than the average per cent of weekly reports stated presence of bronchitis in months when the meteorological condition named at the head of the column was **less** than the average for the year and **less** in months when the same condition was **greater** than the average for the year. See proposition 2, relating to bronchitis, page 116.

\* How many stations, and what stations are represented in the statements for each meteorological subject may be seen by referring to Exhibit VIII., page 114, in which the stations are named, and a statement for the year 1888, in relation to each meteorological subject, is given for each station included in the average for that subject. In Exhibit VIII., is also stated what time the tri-daily observations were made at each station. Additional statements relative to meteorological conditions may be found in an article on the Principal Meteorological Conditions in Michigan in 1888, on pages 1-77 of this Report.

† Explanations of statements in these columns, and other statements relative to the prevalence, in 1888 of the diseases under consideration, may be found in Tables 2, pp. 98-107, and 4, pages 108-9, of this Report, and also in Diagrams 1 (p. 87), 2, 3, 4, 5 and 6, on following pages. When the per cent of reports stated for any disease is the same for two months or for any month is the same as the average, the order of months in the first column of these exhibits has been determined by reference to fractional per cents.

‡ Small numbers in this column indicate great prevalence in the localities where the disease occurred, as compared with other diseases; and large numbers a less prevalence.

§ Calculated from readings of dry bulb and wet bulb thermometers.

|| Calculated for 18 respirations per minute, of 20 cubic inches of air each.

\* Assuming the air exhaled to be saturated with vapor at the temperature of 98° F., in which case each cubic foot of air contains 18.69 grains of vapor, and 18 respirations per minute, of 20 cubic inches of air each, make 11.68 Troy ounces of vapor exhaled daily. No correction has been made for expansion of air after it is inhaled.

\*\* The daily range from which numbers in this column were computed is the difference between the highest and the lowest of the four observations taken during the 24 hours, namely at 7 A. M., 2 P. M., 9 P. M. of one day, and 7 A. M. of the following day, or at U. S. Signal Service Stations at 7 A. M., 3 P. M., 10 P. M., and 7 A. M., seventy-fifth meridian time, as stated in the \* foot-note on page 114.

**EXHIBIT XII.—PNEUMONIA AND MEMBRANOUS CROUP.—***Stating for the Year and for each Month of the Year 1888, what per cent of the weekly Reports of Sickness Stated Presence of Pneumonia; also of Membranous Croup, and what were the Meteorological Conditions as observed at Stations in Michigan.\**

PNEUMONIA.				Temperature, F.		Humidity of Air, % Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by One Person in 24 Hours, Troy Ounces.		Ozone—Relative Scale of 10°.		Miles Per Hour by Anemometer.		Atmospheric Pressure, Inches, Reduced to 32° F.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.†	Average Order of Prevalence Where Present.‡	Average Daily Range by Registering Thermometers.	Average of Three Daily Observations.	Relative Per Cent. of Saturation.	Absolute,—Grs. of Vapor in a Cubic Foot of Air.	Inhaled.¶	Exhaled in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Ozone—Relative Scale of 10°.		Average Velocity of Wind, Miles Per Hour by Anemometer.	Range.			
										Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.		Monthly and for Year.	Average Daily, by 3 Daily Observations.**	Average Pressure.	
More than Av. Per Cent of Pneumonia.	Mar.	54	3.8	17.73	25.89	84	1.67	1.04	10.64	58	4.03	4.27	11.4	1.062	.228	29.203
	Feb.	51	3.9	17.70	21.65	87	1.51	.94	10.74	64	3.65	3.97	10.1	1.609	.302	29.129
	Apr.	44	3.8	18.70	42.81	69	2.55	1.59	10.09	47	4.75	4.98	10.6	1.003	.240	29.250
	Jan.	42	3.9	15.28	15.93	90	1.25	.78	10.90	75	3.52	3.85	10.2	1.283	.332	29.278
	May.	40	4.0	18.04	53.40	71	3.69	2.31	9.37	64	5.57	5.53	9.1	.807	.172	29.065
	Dec.	33	3.7	11.28	30.73	83	1.92	1.20	10.48	73	4.57	5.05	12.0	.940	.223	29.143
	Average ...	30	4.0	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158
Less than Av. Per Cent of Pneumonia.	June	24	4.2	21.11	68.03	70	5.71	3.57	8.11	43	5.06	5.09	8.6	.609	.137	29.069
	Nov.	24	4.0	13.47	38.73	79	2.49	1.56	10.12	64	3.61	3.61	10.2	.801	.206	29.202
	Oct.	17	3.9	14.58	46.01	76	3.05	1.91	9.77	67	4.33	4.31	10.1	.933	.217	29.070
	Sept.	15	5.0	20.33	58.20	74	4.30	2.69	8.99	40	4.40	4.07	8.8	.886	.189	29.174
	July.	13	4.1	20.68	70.95	71	5.95	3.72	7.96	45	3.15	3.04	7.3	.451	.105	29.166
	Aug.	10	5.3	20.21	68.05	72	5.59	3.49	8.19	45	3.77	3.73	8.6	.603	.137	29.144
	Average ...	4	5.1	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158
MEMBRANOUS CROUP.																
More than Av. Per Cent of Mem. Croup.	Jan.	7	5.3	15.28	15.93	90	1.25	.78	10.90	75	3.52	3.85	10.2	1.283	.332	29.278
	Apr.	7	5.8	18.70	42.81	69	2.55	1.59	10.09	47	4.75	4.98	10.6	1.003	.240	29.250
	Mar.	6	6.2	17.73	25.89	84	1.67	1.04	10.64	58	4.03	4.27	11.4	1.062	.228	29.203
	Dec.	5	3.6	11.28	30.73	83	1.92	1.20	10.48	73	4.57	5.05	12.0	.940	.223	29.143
	Feb.	5	4.7	17.70	21.65	87	1.51	.94	10.74	64	3.65	3.97	10.1	1.609	.302	29.129
	May.	5	5.6	18.04	53.40	71	3.69	2.31	9.37	64	5.57	5.53	9.1	.807	.172	29.065
	Average ...	4	5.1	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158
Less than Av. Per Cent of Mem. Croup.	Oct.	4	5.2	14.58	46.01	76	3.05	1.91	9.77	67	4.33	4.31	10.1	.933	.217	29.070
	Nov.	3	4.4	13.47	38.73	79	2.49	1.56	10.12	64	3.61	3.61	10.2	.801	.206	29.202
	June.	3	5.0	21.11	68.03	70	5.71	3.57	8.11	43	5.06	5.09	8.6	.609	.137	29.069
	Sept.	1	3.8	20.33	58.20	74	4.30	2.69	8.99	40	4.40	4.07	8.8	.886	.189	29.174
	Aug.	0.8	4.3	20.21	68.05	72	5.59	3.49	8.19	45	3.77	3.73	8.6	.603	.137	29.144
	July.	0.5	6.0	20.68	70.95	71	5.95	3.72	7.96	45	3.15	3.04	7.3	.451	.105	29.166
	Average ...	4	5.1	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158

\*, †, ‡, §, ¶, \*\*, See foot-notes with these marks in Exhibit X., page 119.

a An exception to Proposition 1, relating to Pneumonia and Membranous Croup, on page 117.

b An exception to Proposition 2, relating to Pneumonia and Membranous Croup, on page 117.

DIAGRAM 2—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1888.

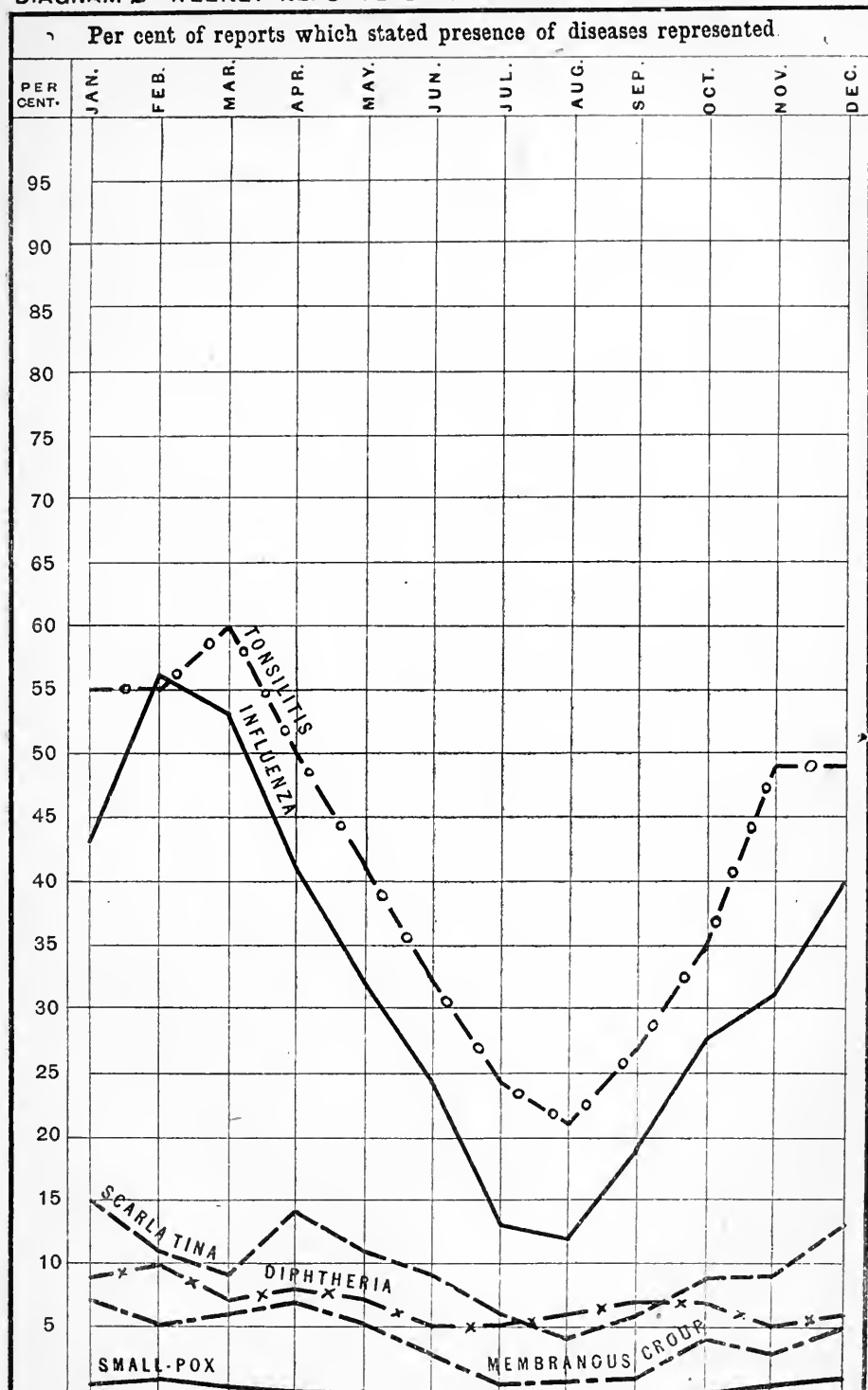


EXHIBIT XIII.—*By Year and Months for 1888 and for the preceding year, and an Average for the Eleven Years 1877-87. \* Stating on what Per Cent of the Weekly Reports received PNEUMONIA, MEMBRANOUS CROUP, DIPHTHERIA, RHEUMATISM, INFLUENZA, SCARLET FEVER, TONSILLITIS, \* AND NEURALGIA \* were Reported Present, and Comparing the Per Cents for Months in 1888, with the Averages for Corresponding Months in those years.†*

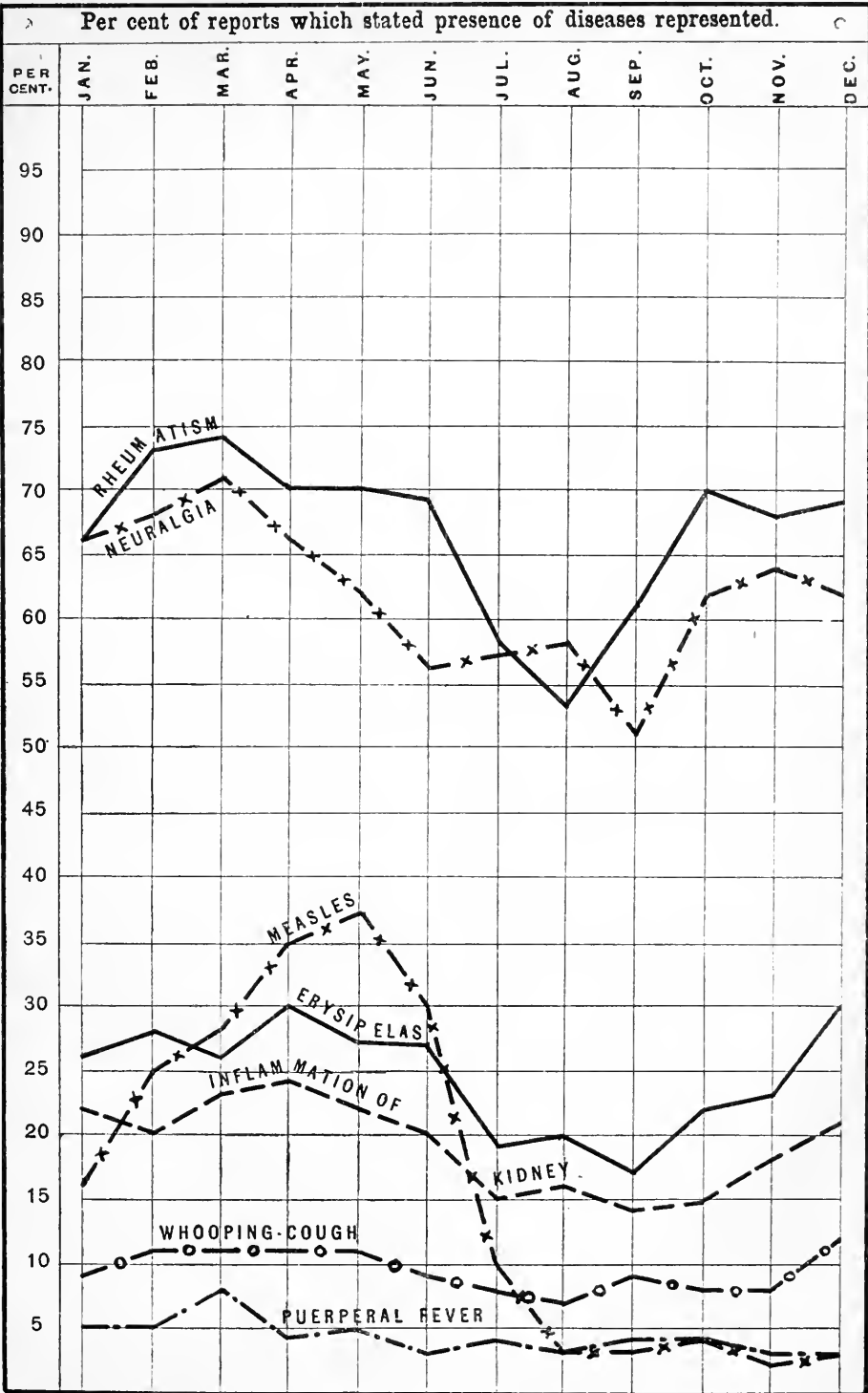
Years, Etc.		Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.													Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Pneumonia.	Av. 11 years, 1877-87 .....	36	57	62	60	53	39	24	16	13	16	21	33	44	Membranous Group.	{	6	11	9	8	7	5	4	2	2	4	6	9	10										
	1887 .....	28	48	51	50	41	34	16	10	8	14	17	28	31			4	10	6	4	6	5	2	1	2	2	4	8	6										
	1888 .....	30	42	51	54	44	40	24	13	10	15	17	24	33			4	7	5	6	7	5	3	1	0.5	0.8	1	4	3	5									
	In 1888 <b>Greater</b> than Av. 1877-87 .....	—	—	—	—	—	1	—	—	—	—	—	—	—			—	—	—	—	—	—	—	—	—	—	—	—	—	—									
	In 1888 <b>Less</b> than Av. 1877-87 .....	6	15	11	6	9	—	—	3	3	1	4	9	11			2	4	4	2	—	—	1	—	1.5	1.2	3	2	6	5									
Diphtheria.	Av. 11 years, 1877-87 .....	21	26	23	20	19	16	14	14	15	17	25	28	26	Rheumatism.	{	69	73	73	75	75	71	68	61	58	61	67	72	73										
	1887 .....	10	13	11	11	5	6	5	5	6	7	16	19	12			69	76	74	77	77	71	70	57	61	66	66	69	70										
	1888 .....	7	9	10	7	8	7	5	5	6	7	7	5	6			66	66	73	74	70	70	69	58	53	61	70	68	69										
	In 1888 <b>Greater</b> than Av. 1877-87 .....	—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	1	—	—	—	—	—	—	—										
	In 1888 <b>Less</b> than Av. 1877-87 .....	14	17	13	13	11	9	9	9	9	10	18	23	20			3	7	—	1	5	1	—	3	5	—	—	4	4										
Influenza.	Av. 11 years, 1877-87 .....	39	55	60	59	51	38	28	20	20	29	32	41	47	Scarlatina.	{	17	21	22	23	21	18	16	13	11	12	15	17	17										
	1887 .....	33	47	52	50	43	34	23	13	18	27	28	35	38			8	11	11	12	10	6	4	3	4	7	9	10	11										
	1888 .....	32	43	56	53	41	32	24	13	12	19	28	31	40			9	15	11	9	14	11	9	6	4	6	9	9	13										
	In 1888 <b>Greater</b> than Av. 1877-87 .....	—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	—	—	—	—	—	—	—										
	In 1888 <b>Less</b> than Av. 1877-87 .....	7	12	4	6	10	6	4	7	8	10	4	10	7			8	6	11	14	7	7	7	7	7	6	6	8	4										
Tonsillitis.	Av. 9 years, 1879-87 .....	48	60	61	60	53	47	41	32	32	37	45	55	60	Neuralgia.	{	66	69	71	73	73	67	65	60	58	60	63	68	70										
	1887 .....	47	56	59	61	53	46	37	29	31	38	47	54	57			67	72	73	76	71	67	66	62	59	65	66	66	65										
	1888 .....	41	55	55	60	50	41	32	24	21	27	35	49	49			62	66	68	71	66	62	56	57	58	51	62	64	62										
	In 1888 <b>Greater</b> than Av. 1879-87 .....	—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	—	—	—	—	—	—	—										
	In 1888 <b>Less</b> than Av. 1879-87 .....	7	5	6	—	3	6	9	8	11	10	10	6	11			4	3	3	2	7	5	9	3	—	9	1	4	8										

\* The average line for tonsillitis and neuralgia includes only the nine years, 1879-87.

† Other statements for 1888, and months in 1888, relative to these diseases are given in Table 2, pages 98-107, and in Exhibits XII., XIV., XV., and XVI., pages 120, 124, 125, and 126, where are also given for convenient comparison statements of coincident meteorological conditions.

The lines for 1888 in Exhibit XIII. are graphically represented in Diagrams 1, page 87, 2, page 121, and 4 on page 129.

DIAGRAM 3 -WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1888.



**EXHIBIT XIV.—DIPHTHERIA AND TONSILITIS.**—*Stating for the Year and for each Month of the year 1888, what Per Cent of the Weekly Reports of Sickness Stated Presence of Diphtheria, also of Tonsilitis, and what were the Meteorological Conditions as Observed at Stations in Michigan.\**

DIPHTHERIA.			Temperature, F.		Humidity of Air, Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by One Person in 24 Hours. Troy Ounces.		Ozone—Relative Scale of 10°.		Per Hour, by Anemometer.		Atmospheric Pressure, Inches, Reduced to 32° F.			
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of †	Average Order of Prevalence Where Present. ‡	Average Daily Range by Registering Thermometers.	Average of three Daily Observations.	Relative—Per Cent of Saturation.	Absolute—Grains of Vapor in a Cubic Foot of Air.	Inhaled. †	Exhaled in Excess of that Inhaled. ‡	Average Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles Per Hour, by Anemometer.	Range.			
													Monthly and for Year.	Average Daily by 3 Daily Observations. **	Average Pressure.	
More than Av. Per Cent of Diphtheria.	Feb....	10	5.8	17.70	21.65	87	1.51	.94	10.74	64	a3.65	a3.97	10.1	1.609	.302	a29.129
	Jan.....	9	4.2	a15.28	15.93	90	1.25	.78	10.90	75	a3.52	a3.85	10.2	1.283	.332	29.278
	April..	8	5.2	18.70	42.81	a69	2.55	1.59	10.09	a47	4.75	4.98	10.6	1.003	.240	29.250
	March	7	4.4	17.73	25.89	84	1.67	1.04	10.64	58	a4.03	a4.27	11.4	1.062	.228	29.203
	Oct....	7	4.4	a14.53	b46.01	a76	3.05	1.91	9.77	67	4.33	4.31	10.1	.933	.217	a29.070
Average ....		7	4.8	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158
Less than Av. Per Cent of Diphtheria.	May....	7	5.4	a18.04	53.40	71	3.69	2.31	9.37	a64	a5.57	a5.53	9.1	.807	.172	29.065
	Sept... 7	6.5	a20.33	58.20	74	4.30	2.69	8.99	40	a4.40	4.07	8.8	.886	.189	a29.174	
	Dec.... 6	3.2	11.28	b30.73	a83	b1.92	1.20	10.48	a75	a4.57	a5.05	a12.0	a.940	a.223	29.143	
	Aug.... 6	5.3	a20.21	68.05	72	5.59	3.49	8.19	45	3.77	3.73	8.6	.603	.137	29.144	
	Nov.... 5	3.4	13.47	b38.73	a79	b2.49	1.56	10.12	a64	3.61	3.61	a10.2	.801	.206	a29.202	
June ..		5	4.0	a21.11	68.03	70	5.71	3.57	8.11	43	a5.06	a5.09	8.6	.609	.137	29.069
July ...		5	4.6	a20.68	70.95	71	5.95	3.72	7.96	45	3.15	3.04	7.3	.451	.105	a29.166
TONSILLITIS.																
More than Av. Per Cent of Tonsillitis.	March.. 60	3.4	17.73	25.89	84	1.67	1.04	10.64	58	a4.03	a4.27	11.4	1.062	.228	29.203	
	Jan.... 55	3.0	a15.28	15.93	90	1.25	.78	10.90	75	a3.52	a3.85	10.2	1.283	.332	29.278	
	Feb.... 55	3.3	17.70	21.65	87	1.51	.94	10.74	64	a3.65	a3.97	10.1	1.609	.302	a29.129	
	April.. 50	3.3	18.70	42.81	a69	2.55	1.59	10.09	a47	4.75	4.98	10.6	1.003	.240	29.250	
	Dec.... 49	3.2	a11.28	30.73	83	1.92	1.20	10.48	73	4.57	5.05	12.0	.940	.223	a29.143	
Nov.... 49		3.3	a13.47	38.73	79	2.49	1.56	10.12	64	a3.61	a3.61	10.2	a.801	a.206	29.202	
Average ....		41	3.4	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158
Less than Av. Per Cent of Tonsillitis.	May.... 41	3.4	a18.04	53.40	71	3.69	2.31	9.37	a64	a5.57	a5.53	9.1	.807	.172	29.065	
	Oct.... 35	3.2	14.58	46.01	76	b3.05	1.91	9.77	a67	a4.33	a4.31	a10.1	a.933	a.217	29.070	
	June... 32	3.1	a21.11	68.03	70	5.71	3.57	8.11	43	a5.06	a5.09	8.6	.609	.137	29.069	
	Sept.... 27	3.8	a20.33	58.20	74	4.30	2.69	8.99	40	a4.40	4.07	8.8	.886	.189	a29.174	
	July... 24	3.3	a20.68	70.95	71	5.95	3.72	7.96	45	3.15	3.04	7.3	.451	.105	a29.166	
Aug... 21		4.5	a20.21	68.05	72	5.59	3.49	8.19	45	3.77	3.73	8.6	.603	.137	29.144	

\*, †, ‡, §, ||, ¶, \*\*, See foot-notes with these marks in Exhibit X., page 119.

a An exception to proposition 1, relating to diphtheria and tonsilitis, on page 117.

b An exception to proposition 2, relating to diphtheria and tonsilitis on page 117.

EXHIBIT XV.—INFLUENZA AND SCARLET FEVER.—*Stating for the Year and for each Month of the Year 1888, what Per Cent of the Weekly Reports of Sickness Stated Presence of Influenza, also of Scarlet Fever, and what were the Meteorological Conditions as Observed at Stations in Michigan.\**

INFLUENZA.				Temperature, F.		Humidity of Air, % Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by One Person in 24 Hours. Troy Ounces.		Ozone—Relative Scale of 10°.		Miles Per Hour by Anemometer.	Atmospheric Pressure, Inches, Reduced to 32° F.			
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.†	Average Order of Prevalence Where Present.‡	Average Daily Range by Registering Thermometer.	Average of Three Daily Observations.	Relative—Per Ct. of Saturation.	Absolute, — Grs. of Vapor in a Cubic Foot of Air.	Inhaled.‡	Exhaled in Excess of that Inhaled.‡	Average Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.		Average Velocity of Wind, Per Hour by Anemometer.	Range.		Average Pressure.
														Monthly and for Year.	Average Daily, by 3 Daily Observations.**	
More than Av. Per Ct. of Influenza.	Feb. ....	56	2.0	17.70	21.65	87	1.51	.94	10.74	64	a 3.65	a 3.97	10.1	1.609	.302	a29.129
	Mar. ....	53	2.1	17.73	25.89	84	1.67	1.04	10.64	58	a 4.03	a 4.27	11.4	1.062	.228	a29.203
	Jan. ....	43	2.3	a15.28	15.93	90	1.25	.73	10.90	75	a 3.52	a 3.85	10.2	1.283	.332	a29.278
	April ....	41	2.2	18.70	42.81	a 69	2.55	1.59	10.09	a 47	4.75	4.98	10.6	1.003	.240	a29.250
	Dec. ....	40	2.3	a11.28	30.73	83	1.92	1.20	10.48	73	4.57	5.05	12.0	9.40	.223	a29.143
Average ....		32	2.7	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158
Less than Av. Per Ct. of Influenza.	May ....	32	2.9	a18.04	53.40	71	3.69	2.31	9.37	a 64	a 5.57	a 5.53	9.1	.807	.172	a29.065
	Nov. ....	31	2.9	13.47	b38.73	a 79	b 2.49	1.56	10.12	a 64	3.61	3.61	a 10.2	.801	.206	a29.202
	Oct. ....	28	3.0	14.58	46.01	76	b 3.05	1.91	9.77	a 67	a 4.33	a 4.31	a 10.1	a .933	a .217	a29.070
	June ....	24	3.3	a21.11	68.03	70	5.71	3.57	8.11	43	a 5.06	a 5.09	8.6	.609	.137	a29.069
	Sept. ....	19	4.1	a20.33	58.20	74	4.30	2.69	8.99	40	a 4.40	4.07	8.8	.886	.189	a29.174
	July ....	13	3.5	a20.68	70.95	71	5.95	3.72	7.96	45	3.15	3.04	7.3	.451	.105	a29.166
Aug. ....	12	4.0	a20.21	68.05	72	5.59	3.49	8.19	45	3.77	3.73	8.6	.603	.137	a29.144	
SCARLET FEVER.																
More than Av. Per Ct. of Scarlet Fever.	Jan. ....	15	4.5	a15.28	15.93	90	1.25	.78	10.90	75	a 3.52	a 3.85	10.2	1.283	.332	a29.278
	April ....	14	5.1	18.70	42.81	a 69	2.55	1.59	10.09	a 47	4.75	4.98	10.6	1.003	.240	a29.250
	Dec. ....	13	2.6	a11.28	30.73	83	1.92	1.20	10.48	73	4.57	5.05	12.0	.910	.223	a29.143
	Feb. ....	11	4.7	17.70	21.65	87	1.51	.94	10.74	64	a 3.65	a 3.97	10.1	1.609	.302	a29.129
	May ....	11	4.8	18.04	b53.40	a 71	b 3.69	2.31	9.37	64	5.57	5.53	a 9.1	a .807	a .172	a29.065
	Nov. ....	9	4.1	a13.47	38.73	79	2.49	1.56	10.12	64	a 3.61	a 3.61	10.2	a .801	a .206	a29.202
June ....	9	4.5	21.11	b68.03	a 70	b 5.71	3.57	8.11	a 43	5.06	5.09	a 8.6	a .609	a .137	a29.069	
Average ....		9	4.6	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158
Less than Av. Per Ct. of Scarlet Fever.	Oct. ....	9	4.8	14.58	46.01	76	b 3.05	1.91	9.77	a 67	a 4.33	a 4.31	a 10.1	a .933	a .217	a29.070
	Mar. ....	9	5.1	a17.73	b25.89	a 84	b 1.67	1.04	10.64	a 58	4.03	4.27	a 11.4	a 1.062	a .228	a29.203
	July ....	6	4.0	a20.68	70.95	71	5.95	3.72	7.96	45	3.15	3.04	7.3	.451	.105	a29.166
	Sept. ....	6	5.8	a20.33	58.20	74	4.30	2.69	8.99	40	a 4.40	4.07	8.8	.886	.189	a29.174
	Aug. ....	4	5.5	a20.21	68.05	72	5.59	3.49	8.19	45	3.77	3.73	8.6	.603	.137	a29.144

\* †, ‡, §, ¶, \*\*, See footnotes with these marks in Exhibit X, page 119.

a An exception to Proposition 1, relating to Influenza and Scarlet Fever, on page 117.

b An exception to Proposition 2, relating to Influenza and Scarlet Fever, on page 117.

**EXHIBIT XVI.—RHEUMATISM AND NEURALGIA.**—*Stating for the Year and for each Month of the Year 1888, what Per Cent of the Weekly Reports of Sickness Stated Presence of RHEUMATISM, ALSO OF NEURALGIA, and what were the Meteorological Conditions as Observed at Stations in Michigan.\**

RHEUMATISM.		Temperature, F.		Humidity of Air, % Av. of 3 Daily Ob- servations.		Vapor In- haled and ex- haled from the Air Pas- sages by one Person in 24 Hours, Troy Ounces.		Ozone — Relative Scale of 10°.		Atmospheric Pressure, Inches, Reduced to 32° F.														
Months in Order of Great- est Per Cent of Weekly Reports Stating Pres- ence of.	Per Cent of Weekly Reports Stating Presence of,†											Av. Order of Prevalence where Present,‡§	Av. Daily Range by Regis- tering Thermometers.	Average of three Daily Obser- vations.	Relative—Per Cent of Saturation.	Absolute — Grains of Vapor in a Cubic Foot of Air	Inhaled,	Exhaled in Excess of that Inhaled,¶	Average Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles Per Hour, by Anemometer.	Monthly and for Year.	Average Daily by 3 Daily Observa- tions,**
	More than Av. Per Cent of Rheumatism.	Less than Av. Per Cent of Rheumatism.	March.	Feb. ...	Oct. ....	May ...	April..	Dec. ....	June...	Nov. ....	Jan. ....	Average.....	Sept. ...	July ...	Aug ...	Sept. ...	Feb. ...	Oct. ....	May ...	Average.....	Aug....	July ...	June...	Sept. ...
			74	73	70	70	70	69	69	68	66	66	66	61	58	53	62	68	66	64	62	62	56	51
		3.2	3.3	2.7	2.8	3.0	2.7	2.8	2.7	2.8	2.8	3.0	3.4	3.0	3.5	2.7	3.0	2.6	2.4	2.5	2.5	2.5	3.3	
		17.73	17.70	a14.58	18.04	18.70	a11.28	21.11	a13.47	a15.28	a15.28	3.0	a20.33	a20.68	a20.21	17.42	a20.33	a15.28	a13.47	a14.58	a11.28	a21.11	a20.33	
		25.89	21.65	b46.01	b53.40	42.81	30.73	b68.03	38.73	15.93	45.03	58.20	58.20	70.95	68.05	45.03	68.05	15.93	38.73	46.01	30.73	68.03	58.20	
		84	87	a76	a71	a69	83	a70	79	90	77	74	74	71	72	77	72	90	79	a76	83	70	74	
		1.67	1.51	3.05	b3.69	2.55	1.92	b5.71	2.49	1.25	3.31	4.30	4.30	5.95	5.59	3.31	5.59	1.25	2.49	3.05	1.92	5.71	4.30	
		1.04	.94	1.91	2.31	1.59	1.20	3.57	1.56	.78	2.07	2.69	2.69	3.72	3.49	2.07	3.49	.78	1.56	1.91	1.20	3.57	2.69	
		10.64	10.74	9.77	9.37	10.09	10.48	8.11	10.12	10.90	9.61	8.99	8.99	7.96	8.19	9.61	8.19	10.90	10.12	9.77	10.48	8.11	2.69	
		58	64	67	64	a47	73	a43	64	75	57	40	40	45	45	57	45	75	64	67	73	43	40	
		4.03	a3.65	4.33	5.57	4.75	4.57	5.06	a3.61	a3.52	4.20	a4.40	a4.40	3.15	3.77	4.20	3.77	a3.52	a3.61	4.33	4.57	a5.06	a4.40	
		4.27	a3.97	4.31	5.53	4.98	5.05	5.09	a3.61	a3.85	4.29	4.07	4.07	3.04	3.73	4.29	3.73	a3.85	a3.61	4.31	5.05	a5.09	4.07	
		11.4	10.1	10.1	a9.1	10.6	12.0	a8.6	10.2	10.2	9.8	8.8	8.8	7.3	8.6	9.8	8.6	10.2	a8.01	10.1	12.0	8.6	8.8	
		1.062	1.909	.933	a.807	1.003	.940	a.609	a.801	1.283	.916	.886	.886	.451	.603	.916	.603	1.283	a.801	.933	.940	6.09	.886	
		.228	.302	.217	a.172	.240	.223	a.137	a.206	.332	.207	.189	.189	.105	.137	.207	.137	.332	a.206	.217	.223	.137	.189	
		29.203	a29.129	a29.070	a29.065	23.250	a29.143	a29.069	29.202	29.278	29.158	a29.174	a29.166	a29.166	29.144	29.158	29.144	29.278	a29.202	a29.070	a29.143	29.069	a29.174	

\* †, ‡, §, ||, ¶, \*\*. See footnotes with these marks in Exhibit X., page 119.

a An exception to Proposition 1, Relating to Rheumatism and Neuralgia, on page 117.

b An exception to Proposition 2, relating to Rheumatism and Neuralgia, on page 117.



EXHIBIT XVII.—PULMONARY CONSUMPTION AND PLEURITIS.—*Stating for the Year and for each Month of the Year 1888, what Per Cent of the Weekly Reports of Sickness Stated Presence of Pulmonary Consumption, also of Pleuritis, and what were the Meteorological Conditions as Observed at Stations in Michigan.\**

CONSUMPTION.			Temperature, F.		Humidity of Air, § Av. of 3 Daily Ob- servations.		Vapor In- haled and Ex- haled from Air—Passages by one Per- son in 24 Hours. Troy Ounces.		Ozone— Relative Scale of 10°.		Atmospheric Pressure, Inches. Reduced to 32° F.					
Months in Order of Great- est Per Cent of Weekly Reports Stating Pres- ence of.	Per Cent of Weekly Reports Stating Presence of.†	Average Order of Prevalence Where Present.††	Average Daily Range, by Registering Thermometers.	Average of three Daily Ob- servations.	Relative—Per Cent of Saturation.	Absolute—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‡	Ex- haled in Ex- cess of that In- haled.‡	Average Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles Per Hour, by Anemometer.	Range.			
													Monthly and for Year.	Average Daily, by three Daily Obser- vations.**	Average Press:re.	
More than Average Per Cent of Consumption.	June ..	56	4.2	21.11	b68.03	a70	b5.71	3.57	8.11	a43	5.06	5.09	a8.6	a.609	a.137	a29.069
	May...	53	3.5	18.04	b53.40	a71	b3.69	2.31	9.37	64	5.57	5.53	a9.1	a.807	a.172	a29.065
	March.	52	3.9	17.73	25.89	84	1.67	1.04	10.64	58	a4.03	4.27	11.4	1.062	.228	29.203
	July...	51	3.3	20.68	b70.95	a71	b5.95	3.72	7.96	a45	a3.15	a3.04	a7.3	a.451	a.105	29.166
	Feb....	51	4.0	17.70	21.65	87	1.51	.94	10.74	64	a3.65	a3.97	10.1	1.609	.302	a29.129
	Jan....	50	3.8	a15.28	15.93	90	1.25	.78	10.90	75	a3.52	a3.85	10.2	1.283	.332	29.278
Average.....		49	3.6	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158
Less than Average Per Cent of Consumption.	Aug....		3.7	a20.21	68.05	72	5.59	3.49	8.19	45	3.77	3.73	8.6	.603	.137	29.144
	Dec....	48	3.4	11.28	b30.73	a83	b1.92	1.20	10.48	a73	a4.57	a5.05	a12.0	a.940	a.223	29.143
	April..	47	3.7	a18.70	b42.81	69	b2.55	1.59	10.09	47	a4.75	a4.98	a10.6	a1.003	a.240	a29.250
	Nov....	44	3.6	13.47	b38.73	a79	b2.49	1.56	10.12	a64	3.61	3.61	a10.2	.801	.206	a29.202
	Sept....	44	3.9	a20.33	58.20	74	4.30	2.69	8.99	40	a4.40	4.07	8.8	.886	.189	a29.174
	Oct.....	43	3.7	14.58	46.01	76	b3.05	1.91	9.77	a67	a4.33	a4.31	a10.1	a.933	a.217	29.070
PLEURITIS.																
More than Average Per Cent of Pleuritis.	Feb....	32	4.6	17.70	21.65	87	1.51	.94	10.74	64	a3.65	a3.97	10.1	1.609	.302	a29.129
	March	29	4.8	17.73	25.89	84	1.67	1.04	10.64	58	a4.03	a4.27	11.4	1.062	.228	29.203
	Jan....	24	4.8	a15.28	15.93	90	1.25	.78	10.90	75	a3.52	a3.85	10.2	1.283	.332	29.278
	April..	23	4.8	18.70	42.81	a69	2.55	1.59	10.09	a47	4.75	4.98	10.6	1.003	.240	29.250
	Dec....	22	3.9	a11.28	30.73	83	1.92	1.20	10.48	73	4.57	5.05	12.0	.940	.223	a29.143
	May....	18	4.1	18.04	b53.40	a71	b3.69	2.31	9.37	64	5.57	5.53	a9.1	a.807	a.172	a29.065
Average ....		18	4.4	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158
Less than Average Per Cent of Pleuritis.	Nov....	16	4.0	13.47	b38.73	a79	b2.49	1.56	10.12	a64	3.61	3.61	a10.2	.801	.206	a29.202
	Oct.....	15	3.7	14.58	46.01	76	b3.05	1.91	9.77	a67	a4.33	a4.31	a10.1	a.933	a.217	29.070
	June...	14	4.7	a21.11	68.03	70	5.71	3.57	8.11	43	a5.06	a5.09	8.6	.609	.137	29.069
	Sept...	9	5.4	a20.33	58.20	74	4.30	2.69	8.99	40	a4.40	4.07	8.8	.886	.189	a29.174
	Aug...	8	4.5	a20.21	68.05	72	5.59	3.49	8.19	45	3.77	3.73	8.6	.603	.137	29.144
	July...	8	4.6	a20.68	70.95	71	5.95	3.72	7.96	45	3.15	3.04	7.3	.451	.105	a29.166

\* †, ‡, §, ||, ¶, \*\*. See foot-notes with these marks in Exhibit X., page 119.

† An exception to proposition 1, relating to pulmonary consumption and pleuritis, on page 117.

‡ An exception to proposition 2, relating to pulmonary consumption and pleuritis, on page 117.

**EXHIBIT XVIII.—SICKNESS FROM CONSUMPTION.—1878-87.—***By Year and Months for each of the Ten Years 1878-87, Stating on what Per Cent of the Weekly Reports received CONSUMPTION was Reported Present, and Comparing the Per Cents for 1888 with the Averages for Corresponding Months in those Years.*

Years, Etc.	Annual Av.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.
Average for 10 years, 1878-87*.....	63	64	66	68	69	66	63	61	59	60	62	62	62
1877*.....	52	50	47	47	53	49	50	43	35	38	34	68	65
1878.....	71	67	72	76	75	72	68	68	65	70	73	73	71
1879.....	70	71	71	69	77	74	73	69	67	67	69	67	64
1880.....	68	65	69	70	72	70	69	66	62	66	66	68	70
1881.....	71	74	76	73	76	69	68	67	67	70	73	74	67
1882.....	66	66	68	66	66	69	66	67	63	63	65	62	65
1883.....	61	69	66	66	65	62	61	59	55	57	58	58	60
1884.....	63	56	61	66	70	67	65	63	63	63	65	61	58
1885.....	58	60	68	71	69	58	61	56	52	54	55	56	56
1886.....	55	61	53	60	61	60	55	51	52	48	51	55	54
1887.....	51	53	54	61	61	54	48	48	47	45	48	47	50
1888.....	49	50	51	52	47	53	56	51	49	44	43	44	48
In 1888 <b>Greater</b> than Av. 1878-87. ....	...	...	...	...	...	...	...	...	...	...	...	...	...
In 1888 <b>Less</b> than Av. 1878-87. ....	14	14	15	16	22	13	7	10	10	16	19	18	14

\* As consumption was not printed on the first blanks, nor on all used in 1877, that year is excluded from the average line.

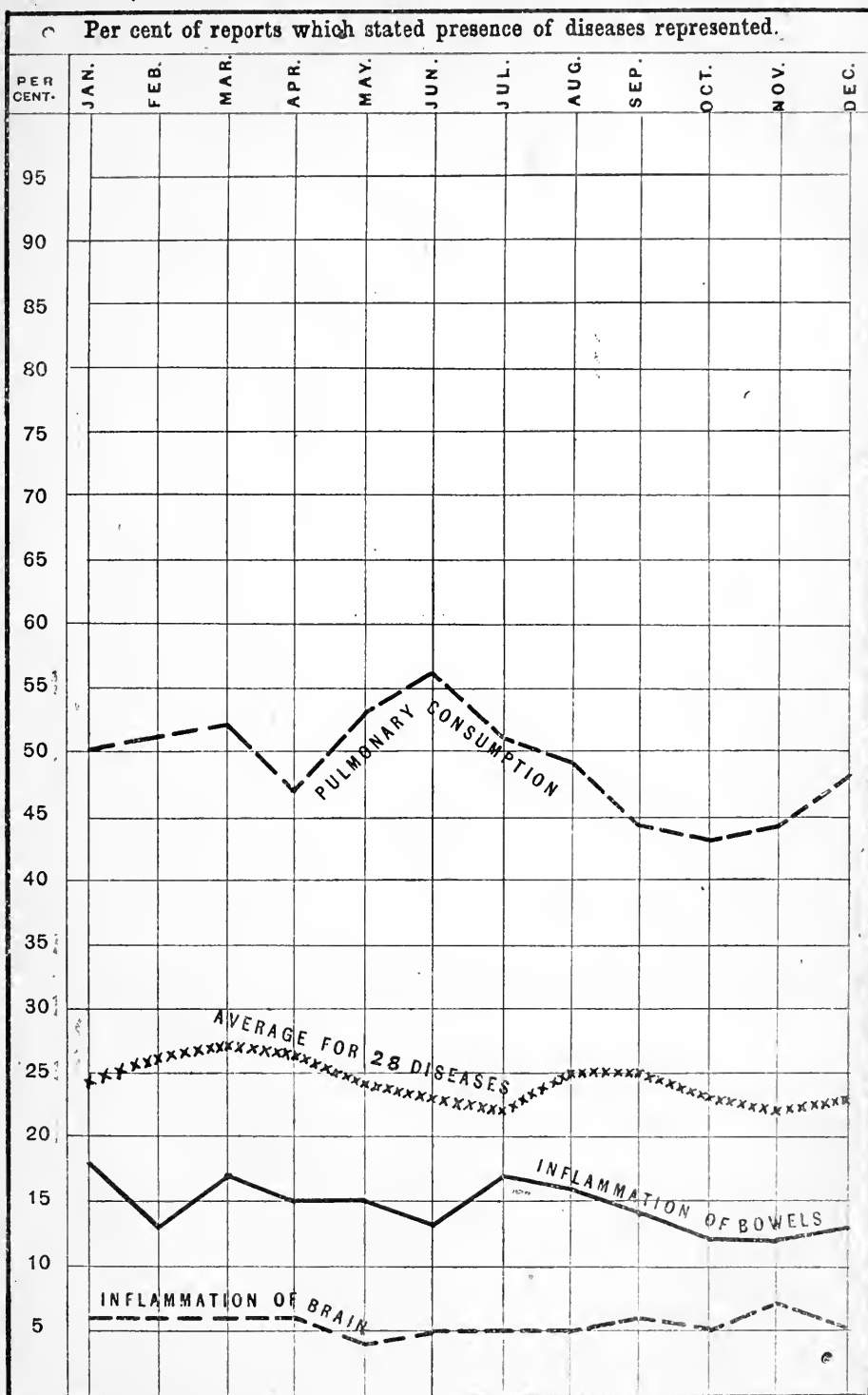
#### RELATIONS OF DIARRHEA TO METEOROLOGICAL CONDITIONS.

**PROPOSITION 1.**—That in months when **more** than the average per cent of weekly reports stated the presence of diarrhea, the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of diarrhea, these conditions were **less** than the average for the year. In Exhibit XIX., page 132, the letter *a* marks exceptions to this proposition for the year 1888.

Explanations of propositions 1 and 2 are given on page 132, and a summary of the evidence in Exhibit XIX. is given in Exhibit XXV., on a following page.

**PROPOSITION 2.**—That in months when **more** than the average per cent of weekly reports stated the presence of diarrhea, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of diarrhea, these conditions were **greater** than the average for the year. In Exhibit XIX., page 132, the letter *b* marks exceptions to this proposition for 1888.

DIAGRAM 4—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1888.



PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to Proposition 1, it is true also that the quantity of vapor inhaled daily was **greater** than the average, and the quantity exhaled daily in excess of that inhaled was **less** than the average in months when **more** than the average per cent of reports stated presence of diarrhea; and that **less** vapor was inhaled and a **greater** excess exhaled daily in months when the per cent of reports stating presence of diarrhea was **less** than the average.

Proposition 3 is true also in relation to cholera infantum, intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles and whooping-cough, treated in Exhibits XIX., XXI., XXII., and XXIII., page 132, and following pages.

On what per cent of the weekly reports received, by months in the eleven years, 1877–1887, the eight foregoing diseases were reported present is stated in Exhibit XX., page 133. In Diagram I, page 87, is graphically represented by months what per cent of the reports in each month in 1888 stated the presence of diarrhea.

The greatest sickness reported from diarrhea in 1888, was in the months of August, September and July.

As shown by Exhibit XX., the reports indicate a lessened prevalence of diarrhea in the year 1888. Compared with the year 1887, there was a slightly increased prevalence of diarrhea in September, 1888, and a marked decrease in June, July, August and October, 1888.

Compared with corresponding months in the average for the eleven years 1877–87, in March the per cent of reports of diarrhea was slightly more in 1888, and for every other month of the year considerably less.

The average temperature for the year 1888 was slightly lower than the average for 1877–87. It was also lower for each month of the year except in June, July, August and September, than the average for corresponding months in the eleven years 1877–87. The absolute humidity was less for the year and for each month of the year, except February, June, November and December, than the average for 1877–87. The relative humidity was more for the year and for January, February, March and May, and less than the average for the ten years 1878–87, for the rest of the year, except for October, November and December which were the same.

#### RELATIONS OF CHOLERA INFANTUM AND OTHER “WARM WEATHER” DISEASES TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of cholera infantum (or of intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles, or whooping-cough), the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of cholera infantum (or of the other diseases named), these conditions were **less** than the average for the year. In Exhibit XIX., page 132, the letter *a* marks exceptions to this proposition for the year 1888.

Explanations of propositions 1 and 2 are given on page 116, and a summary of the evidence of Exhibit XIX. is given in Exhibit XXV., on a following page.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of cholera infantum (or of intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles, or whooping-cough), the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were less than the average for the year; and that in months when less than the average per cent of reports stated the presence of cholera infantum (or of the other diseases named), these conditions were **greater** than the average for the year. In Exhibit XIX., page 132, the letter *b* marks exceptions to this proposition for 1888.

What per cent of all the weekly reports of sickness in each month in 1888 stated the presence of cholera infantum is graphically represented by months in Diagram 1, page 87. What per cent of the reports received by months in the eleven years 1877–87, stated presence of cholera infantum and of the other diseases mentioned in Propositions 1 and 2, is stated in Exhibit XX., page 133.

Cholera infantum was more prevalent during the hot months and in June and October,—August, September and July being the months in 1888 in which more than the average sickness from this disease was reported.

EXHIBIT XIX.—DIARRHEA AND CHOLERA INFANTUM.—*Stating for the Year and for each Month of the Year 1888, what Per Cent of the Weekly Reports of Sickness stated Presence of DIARRHEA, ALSO OF CHOLERA INFANTUM, and what were the Meteorological Conditions as observed at Stations in Michigan.\**

DIARRHEA.			Temperature, F.		Humidity of Air, § Av. of 3 Daily Observations.		Vapor Inhaled and exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces.		Ozone — Relative Scale of 10°.		Atmospheric Pressure, Inches. Reduced to 32° F.					
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.†	Av. Order of Prevalence where Present.‡	Av. Daily Range by Registering Thermometers.	Average of three Daily Observations.	Relative—Per Cent of Saturation.	Absolute — Grains of Vapor in a Cubic Foot of Air.	Inhaled.¶	Exhaled in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles Per Hour, by Anemometer.	Range.		Average Pressure.	
													Monthly and for Year.	Average Daily by 3 Daily Observations.‡‡		
More than Av. Per Cent of Diarrhea.	Aug....	78	1.7	20.21	68.05	72	5.59	3.49	8.19	45	3.77	3.73	8.6	a.603	a.137	a29.144
	Sept....	73	2.0	20.33	58.20	74	4.30	2.69	8.99	40	b4.40	4.07	8.8	a.886	a.189	29.174
	July....	60	2.0	20.68	70.95	71	5.95	3.72	7.96	45	3.15	3.04	7.3	a.451	a.105	29.166
Average.....		41	3.0	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158
Less than Av. Per Cent of Diarrhea.	Oct....	37	2.7	14.58	a46.01	b76	3.05	1.91	9.77	67	4.33	4.31	10.1	a.933	a.217	29.070
	June..	35	2.9	a21.11	a68.03	b70	a5.71	3.57	8.11	b43	5.06	5.09	b 8.6	.609	.137	29.069
	Nov....	31	3.6	13.47	38.73	79	2.49	1.56	10.12	64	b3.61	b3.61	10.2	.801	.206	a29.202
	March.	31	4.4	a17.73	25.89	84	1.67	1.04	10.64	58	b4.03	b4.27	11.4	a1.062	a.228	a29.203
	May....	30	3.8	a18.04	a53.40	b71	a3.69	2.31	9.37	64	5.57	5.53	b 9.1	.807	.172	29.065
	April..	29	4.3	a18.70	42.81	b69	2.55	1.59	10.09	b47	4.75	4.98	10.6	a1.003	a.240	a29.250
	Feb....	26	4.5	a17.70	21.65	87	1.51	.94	10.74	64	b3.65	b3.97	10.1	a1.609	a.302	29.129
	Dec....	25	3.6	11.28	30.73	83	1.92	1.20	10.48	73	4.57	5.05	12.0	a.940	a.223	29.143
	Jan.....	23	4.4	15.28	15.93	90	1.25	.78	10.90	75	b3.52	b3.85	10.2	a1.283	a.332	a29.278
CHOLERA INFANTUM.																
More than Av. Per Cent of Cholera Infantum.	Aug....	40	3.3	20.21	68.05	72	5.59	3.49	8.19	45	3.77	3.73	8.6	a.603	a.137	a29.144
	Sept....	29	4.0	20.33	58.20	74	4.30	2.69	8.99	40	b4.40	4.07	8.8	a.886	a.189	29.174
	July....	23	3.5	20.68	70.95	71	5.95	3.72	7.96	45	3.15	3.04	7.3	a.451	a.105	29.166
	Average.....	11	4.0	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158
Less than Av. Per Cent of Cholera Infantum.	June....	9	4.2	a21.11	a68.03	b70	a5.71	3.57	8.11	b 43	5.06	5.09	b 8.6	.609	.137	29.069
	Oct....	7	4.7	14.58	a46.01	b76	3.05	1.91	9.77	67	4.33	4.31	10.1	a.933	a.217	29.070
	Dec....	3	5.0	11.28	30.73	83	1.92	1.20	10.48	73	4.57	5.05	12.0	a.940	a.223	29.143
	May....	3	5.6	a18.04	a53.40	b71	a3.69	2.31	9.37	64	5.57	5.53	b 9.1	.807	.172	29.065
	Nov....	2	4.3	13.47	38.73	79	2.49	1.56	10.12	64	b3.61	b3.61	10.2	.801	.206	a29.202
	April..	2	5.5	a18.70	42.81	b69	2.55	1.59	10.09	b 47	4.75	4.98	10.6	a1.003	a.240	a29.250
	March	2	6.0	a17.73	25.89	84	1.67	1.04	10.64	58	b4.03	b4.27	11.4	a1.062	a.228	a29.203
	Jan.....	1	7.0	15.28	15.93	90	1.25	.78	10.90	75	b3.52	b3.85	10.2	a1.283	a.332	a29.278
	Feb....	0.7	7.0	a17.70	21.65	87	1.51	.94	10.74	64	b3.65	b3.97	10.1	a1.609	a.302	29.129

\*, †, ‡, §, ||, ¶, \*\*, See footnotes with these marks in Exhibit X., page 119.

b An exception to Proposition 1, relating to diarrhea and cholera infantum, on page 123.

b An exception to Proposition 2, relating to diarrhea and cholera infantum, on page 123.

EXHIBIT XX.—By Year and Months for 1888 and for the Preceding Year, and an Average for the Eleven Years 1877-87. Stating on what Per Cent of the Weekly Reports Received DIARRHEA, CHOLERA INFANTUM, INTERMITTENT FEVER, REMITTENT FEVER, TYPHOID FEVER, TYPHO-MALARIAL FEVER, MEASLES, and WHOOPING-COUGH were Reported Present, and Comparing the Per Cents for 1888, with the Averages for Corresponding Months in those years.\*

Years, Etc.		Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.		
Diarrhea.	Av. 11 years, 1877-87.....	47	27	28	29	32	36	46	73	86	80	55	36	28	Cholera Infantum.	13
	1887.....	48	28	32	31	32	36	52	82	85	71	46	34	30		13
	1888.....	41	23	26	31	29	30	35	60	78	73	37	31	25		11
	In 1888 Greater than Av. 1877-87.....	---	---	---	2	---	---	---	---	---	---	---	---	---		---
	In 1888 Less than Av. 1877-87.....	6	4	2	---	3	6	11	13	8	7	18	5	3		2
																1
Intermittent Fever.	Av. 11 years, 1877-87.....	70	57	59	62	70	76	78	79	79	79	76	67	59	Remittent Fever.	47
	1887.....	48	39	42	48	50	52	53	55	53	50	42	39			32
	1888.....	45	40	41	45	45	46	44	47	46	48	48	43	38		34
	In 1888 Greater than Av. 1877-87.....	---	---	---	---	---	---	---	---	---	---	---	---	---		---
	In 1888 Less than Av. 1877-87.....	25	17	18	17	25	30	34	32	33	31	28	24	21		13
																8
Typhoid Fever.	Av. 11 years, 1877-87.....	12	11	9	6	6	5	6	7	13	20	22	20	15	Typho-malarial Fever.	21
	1887.....	10	6	10	4	3	3	4	8	14	22	18	15	11		16
	1888.....	10	10	7	6	5	4	5	7	12	18	16	12	10		15
	In 1888 Greater than Av. 1877-87.....	---	---	---	---	---	---	---	---	---	---	---	---	---		---
	In 1888 Less than Av. 1877-87.....	2	1	2	---	1	1	1	---	2	6	8	5			6
																5
Measles.	Av. 11 years, 1877-87.....	13	10	13	16	21	25	21	14	7	5	5	6	8	Whooping-cough.	20
	1887.....	14	11	17	22	22	25	19	15	6	4	5	9	11		14
	1888.....	16	16	25	28	35	37	30	10	3	3	4	2	3		9
	In 1888 Greater than Av. 1877-87.....	---	---	---	---	---	---	---	---	---	---	---	---	---		---
	In 1888 Less than Av. 1877-87.....	3	6	12	12	14	12	9	---	---	---	---	---	---		11
																9

\* Other statements for 1888 and months in 1888, relative to these diseases, are given in Table 2, pages 98-99, and in Exhibits XIX, XXI, XXII, and XXIII., pages 132, 134, and 137, where are also given for convenient comparison statements of coincident meteorological conditions. The lines for 1888 are graphically represented in Diagrams 1, page 87; 3, page 123; and 4, page 129.

**EXHIBIT XXI.—INTERMITTENT FEVER AND REMITTENT FEVER.**—*Stating for the Year and for each Month of the Year 1888, what Per Cent of the Weekly Reports of Sickness Stated Presence of Intermittent Fever, also of Remittent Fever, and what were the Meteorological Conditions Observed at Stations in Michigan.\**

INTERMITTENT FEVER.			Temperature, F.		Humidity of Air, & Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by One Person in 24 Hours. Troy Ounces.		Ozone—Relative Scale of 10°.		Miles Per Hour by Anemometer.	Atmospheric Pressure, Inches, Reduced to 32° F.					
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.†	Average Order of Prevalence Where Present.††	Average Daily Range by Registering Thermometers.	Average of Three Daily Observations.	Relative—Per Ct. of Saturation.	Absolute—Grs. of Vapor in a Cubic Foot of Air.	Inhaled.‡	Exhaled in Excess of that Inhaled.‡	Average Per Cent of Cloudiness.	7 A.		Average Velocity of Wind, Per Hour by Anemometer.	Range.		Average Daily, by 3 Daily Observations.‡‡	Average Pressure.	
										Day Observation, M. to 2 P. M.			Night Observation, P. M. to 7 A. M.	Monthly and for Year.			Average Daily, by 3 Daily Observations.‡‡
More than Av. Per Cent of Intermittent Fever.	Sept. . .	48	2.2	20.33	58.20	74	4.30	2.69	8.99	40	b 4.40	4.07	8.8	a .886	a .189	29.174	
	Oct. . . .	48	2.2	a14.58	46.01	76	a 3.05	1.91	9.77	b 67	b 4.33	b 4.31	b 10.1	.933	.217	a29.070	
	July. . .	47	2.2	20.68	70.95	71	5.95	3.72	7.96	45	3.15	3.04	7.3	a .451	a .105	29.166	
	Aug. . .	46	2.6	20.21	68.05	72	5.59	3.49	8.19	45	3.77	3.73	8.6	a .603	a .137	a29.144	
	May. . .	46	2.7	18.04	53.40	71	3.69	2.31	9.37	b 64	b 5.57	b 5.53	9.1	a .807	a .172	a29.065	
Average . . .		45	2.6	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158	
Less than Av. Per Cent of Intermittent Fever.	April. . .	45	2.9	a18.70	42.81	b 69	2.55	1.59	10.09	b 47	4.75	4.98	10.6	a 1.003	a .240	a29.250	
	Mar. . .	45	3.2	a17.73	25.89	84	1.67	1.04	10.64	58	b 4.03	b 4.27	11.4	a 1.062	a .228	a29.203	
	June . .	44	2.2	a21.11	a68.03	b 70	a 5.71	3.57	8.11	b 43	5.06	5.09	b 8.6	.609	.137	29.069	
	Nov. . .	43	2.2	13.47	38.73	79	2.49	1.56	10.12	64	b 3.61	b 3.61	10.2	.801	.206	a29.202	
	Feb. . .	41	3.4	a17.70	21.65	87	1.51	.94	10.74	64	b 3.65	b 3.97	10.1	a 1.609	a .302	29.129	
	Jan. . .	40	3.3	15.28	15.93	90	1.25	.78	10.90	75	b 3.52	b 3.85	10.2	a 1.283	a .332	a29.278	
	Dec. . .	38	2.7	11.28	30.73	83	1.92	1.20	10.48	73	4.57	5.05	12.0	a .940	a .223	29.143	
REMITTENT FEVER.																	
More than Av. Per Cent of Remittent Fever.	Sept. . .	47	2.6	20.33	58.20	74	4.30	2.69	8.99	40	b 4.40	4.07	8.8	a .886	a .189	29.174	
	Aug. . .	41	3.0	20.21	68.05	72	5.59	3.49	8.19	45	3.77	3.73	8.6	a .603	a .137	a29.144	
	Oct. . .	39	2.5	a14.58	46.01	76	a 3.05	1.91	9.77	b 67	b 4.33	b 4.31	b 10.1	.933	.217	a29.070	
	Feb. . .	35	3.9	17.70	a21.65	b 97	a 1.51	.94	10.74	b 64	3.65	3.97	b 10.1	1.609	.302	a29.129	
Average . . .		34	3.1	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158	
Less than Av. Per Cent of Remittent Fever.	Nov. . .	33	2.7	13.47	38.73	79	2.49	1.56	10.12	64	b 3.61	b 3.61	10.2	.801	.206	a29.202	
	May . .	33	3.0	a18.04	a53.40	b 71	a 3.69	2.31	9.37	64	5.57	5.53	b 9.1	.807	.172	29.065	
	Mar. . .	32	3.9	a17.73	25.89	84	1.67	1.04	10.64	58	b 4.03	b 4.27	11.4	a 1.062	a .228	a29.203	
	April. .	31	3.6	a18.70	42.81	b 69	2.55	1.59	10.09	b 47	4.75	4.98	10.6	a 1.003	a .240	a29.250	
	Jan. . .	31	4.0	15.28	15.93	90	1.25	.78	10.90	75	b 3.52	b 3.85	10.2	a 1.283	a .332	a29.278	
	June . .	30	2.8	a21.11	a68.03	70	a 5.71	3.57	8.11	b 43	5.06	5.09	b 8.6	.609	.137	29.069	
	Dec. . .	30	3.0	11.28	30.73	83	1.92	1.20	10.48	73	4.57	5.05	12.0	a .940	a .223	29.143	
		28	2.9	a20.68	a70.95	b 71	a 5.95	3.72	7.96	b 45	b 3.15	b 3.04	b 7.3	.451	.105	a29.166	

\* †, ‡, §, ¶, \*\*. See footnotes with these marks in Exhibit X, page 119.

α An exception to Proposition 1, relating to Intermittent Fever and Remittent Fever, on page 130.

b An exception to Proposition 2, relating to Intermittent Fever and Remittent Fever, on page 130.



DIAGRAM 5—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1888.

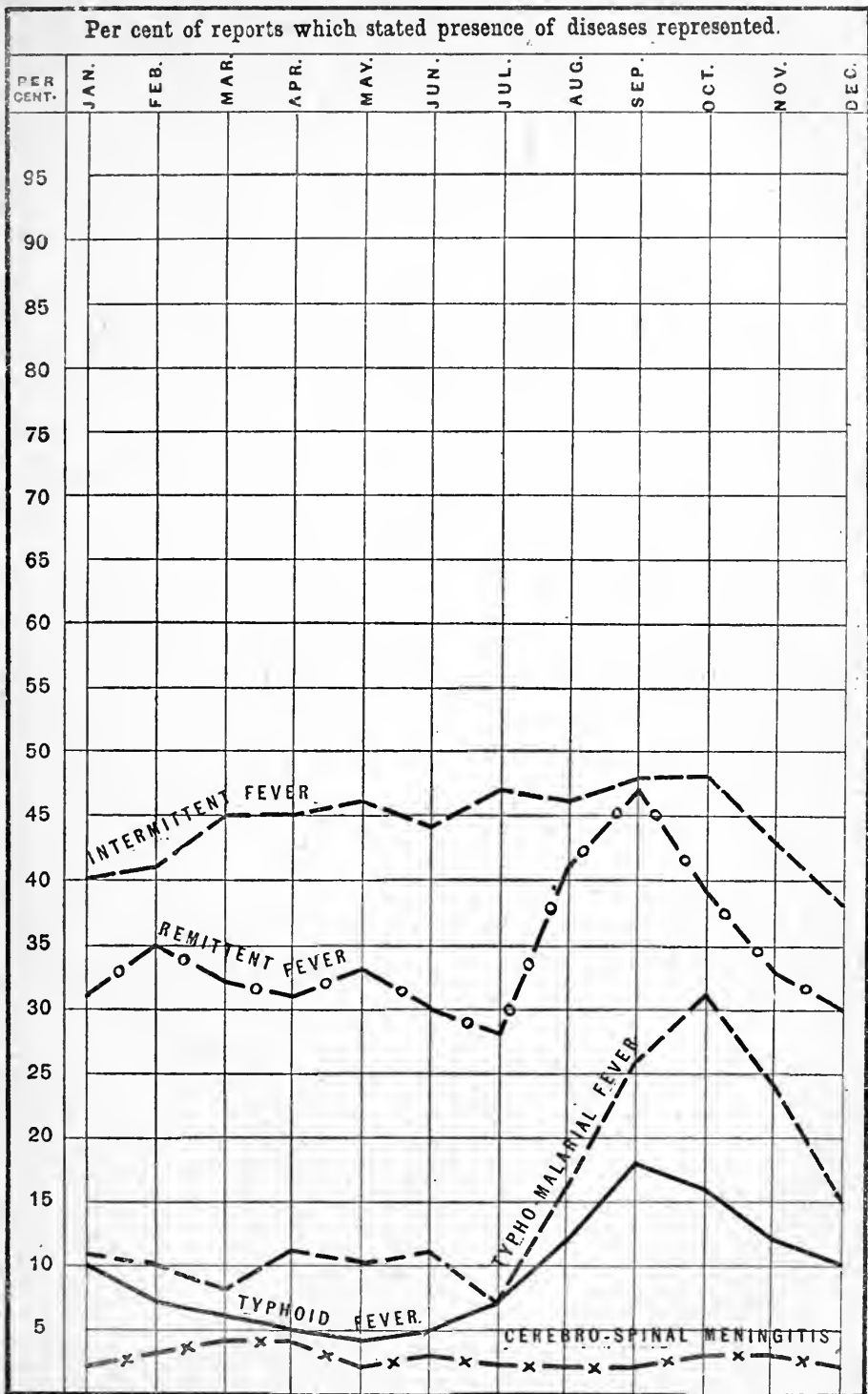


EXHIBIT XXII.—TYPHOID FEVER AND TYPHO-MALARIAL FEVER.—*Stating for the Year and for each Month of the Year 1888, what Per Cent of the Weekly Reports of Sickness Stated Presence of Typhoid Fever, also of Typho-malarial Fever, and what were the Meteorological Conditions as Observed at Stations in Michigan.\**

TYPHOID FEVER.				Temperature, F.		Humidity of Air, % Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by One Person in 24 Hours. Troy Ounces.		Ozone—Relative Scale of 10°.		Per Average Velocity of Wind, Miles Per Hour, by Anemometer.		Atmospheric Pressure, Inches. Reduced to 32° F.			
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per Cent of Weekly Reports Stating Presence of †	Average Order of Prevalence Where Present, ‡	Average Daily Range by Registering Thermometers.		Average of three Daily Observations.		Relative—Per Cent of Saturation.	Absolute—Grains of Vapor in a Cubic Foot of Air.	Inhaled. ‖	Exhaled in Excess of that Inhaled. ¶	Average Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Monthly and for Year.	Average Daily by 5 Daily Observations. **	Average Pressure.
More than Av. Per Cent of Typhoid Fever.	Sept. . .	18	4.0	20.33	58.20	74	4.30	2.69	8.99	40	b4.40	4.07	8.8	a.886	a.189	29.174	
	Oct. . . .	16	3.6	a14.58	46.01	76	a3.05	1.91	9.77	b67	b4.33	b4.31	b'0.1	.933	.217	a29.070	
	Nov. . . .	12	3.7	a13.47	a38.73	b79	a2.49	1.56	10.12	b64	3.61	3.61	b'0.2	a.801	a.206	29.202	
	Aug. . . .	12	4.2	20.21	68.05	72	5.59	3.49	8.19	45	3.77	3.73	8.6	a.603	a.137	a29.144	
	Average	10	4.2	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158	
Less than Average Per Cent of Typhoid Fever.	Dec. . . .	10	4.6	11.28	30.73	83	1.92	1.20	10.48	73	4.57	5.05	12.0	a.940	a.223	29.143	
	Jan. . . . .	10	5.1	15.28	15.93	90	1.25	.78	10.90	75	b3.52	b3.85	10.2	a1.283	a.332	a29.278	
	July . . . .	7	3.4	a20.68	a70.95	b71	a5.95	3.72	7.96	b45	b3.15	b3.04	b7.3	.451	.105	a29.166	
	Feb. . . . .	7	5.2	a17.70	21.65	87	1.51	.94	10.74	64	b3.65	b3.97	10.1	a1.609	a.302	29.129	
	March . . .	6	4.8	a17.73	25.89	84	1.67	1.04	10.64	58	b4.03	b4.27	11.4	a1.062	a.228	a29.203	
	June . . . .	5	3.7	a21.11	a68.03	b70	a5.71	3.57	8.11	b43	5.06	5.09	b8.6	.609	.137	29.069	
	April . . .	5	5.6	a18.70	42.81	b69	2.55	1.59	10.09	b47	4.75	4.98	10.6	a1.003	a.240	a29.250	
	May . . . .	4	5.6	a18.04	a53.40	b71	a3.69	2.31	9.37	64	5.57	5.53	b9.1	.807	.172	29.065	
TYPHO MALARIAL FEVER.																	
More than Av. Per Cent of Typho-mal. Fev.	Oct. . . . .	31	2.9	a14.58	46.01	76	a3.05	1.91	9.77	b67	b4.33	b4.31	b10.1	.933	.217	a29.070	
	Sept. . . .	26	3.2	20.33	58.20	74	4.30	2.69	8.99	40	b4.40	4.07	8.8	a.886	a.189	29.174	
	Nov. . . . .	24	3.3	a13.47	a38.73	b79	a2.49	1.56	10.12	b64	3.61	3.61	b10.2	a.801	a.206	29.202	
	Aug. . . .	16	4.0	20.21	68.05	72	5.59	3.49	8.19	45	3.77	3.73	8.6	a.603	a.137	a29.144	
Average . . . .		15	3.6	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158	
Less than Average Per Cent of Typho-malarial Fever.	Dec. . . . .	15	3.9	11.28	30.73	83	1.92	1.20	10.48	73	4.57	5.05	12.0	a.940	a.223	29.143	
	June . . . .	11	3.4	a21.11	a68.03	b70	a5.71	3.57	8.11	b43	5.06	5.09	b8.6	.609	.137	29.069	
	Jan. . . . .	11	4.1	15.28	15.93	90	1.25	.78	10.90	75	b3.52	b3.85	10.2	a1.283	a.332	a29.278	
	April . . .	11	4.5	a18.70	42.81	b69	2.55	1.59	10.09	b47	4.75	4.98	10.6	a1.003	a.240	a29.250	
	May . . . .	10	4.0	a18.04	a53.40	b71	a3.69	2.31	9.37	64	5.57	5.53	b9.1	.807	.172	29.065	
	Feb. . . . .	10	4.0	a17.70	21.65	87	1.51	.94	10.74	64	b3.65	b3.97	10.1	a1.609	a.302	29.129	
	March . . .	8	4.8	a17.73	25.89	84	1.67	1.04	10.64	58	b4.03	b4.27	11.4	a1.062	a.228	a29.203	
	July . . . .	7	3.9	a20.68	a70.95	b71	a5.95	3.72	7.96	b45	b3.15	b3.04	b7.3	.451	.105	a29.166	

\*, †, ‡, §, ||, ¶, \*\*, See foot-notes with these marks in Exhibit X., page 119.

a An exception to Proposition 1, relating to typhoid and typho-malarial fever, on page 130.

b An exception to Proposition 2, relating to typhoid and typho-malarial fever on page 130.

EXHIBIT XXIII.—MEASLES AND WHOOPING-COUGH.—*Stating for the Year and for each Month of the Year 1888, what Per Cent of the Weekly Reports of Sickness Stated Presence of MEASLES, ALSO OF WHOOPING-COUGH, and what were the Meteorological Conditions as Observed at Stations in Michigan.\**

MEASLES.				Temperature, F.		Humidity of Air, § Av. of 3 Daily Ob- servations.		Vapor In- haled and Ex- haled from the Air-Pas- sages by one Person in 24 Hours. Troy Ounces.			Ozone— Relative Scale of 10°.		Atmospheric Pressure, Inches. Reduced to 32° F.			
Months In Order of Great- est Per Cent of Weekly Reports Stating Pres- ence of.	Per Cent of Weekly Reports Stating Presence of,†	Average Order of Prevalence Where Present,‡	Average Daily Range, by Registering Thermometers.	Average of three Daily Ob- servations.	Relative—Per Cent of Saturation.	Absolute—Grains of Vapor in a Cubic Foot of Air.	Inhaled,	Exhaled in Ex- cess of that In- haled,¶	Average Per Cent of Cloudiness.	Day Observation, 7 A. M. to 3 P. M.	Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles Per Hour, by Anemometer.	Range.			
													Monthly and for Year.	Average Daily, by three Daily Obser- vations,**	Average Pressure.	
More than Av. Per Ct. of Measles.	{ May...	37	2.4	18.04	53.40	71	3.69	2.31	9.37	b 64	b5.57	b5.53	9.1	a.807	a.172	a29.065
	{ April...	35	2.7	18.70	a42.81	69	a2.55	1.59	10.09	47	b4.75	b4.98	b10.6	1.003	.240	29.250
	{ June...	30	2.9	21.11	68.03	70	5.71	3.57	8.11	43	b5.06	b5.09	8.6	a.609	a.137	a29.069
	{ March...	28	3.1	17.73	a25.89	b 84	a1.67	1.04	10.64	b 58	4.03	4.27	b11.4	1.062	.228	29.203
	{ Feb....	25	3.4	17.70	a21.65	b 87	a1.51	.94	10.74	b 64	3.65	3.97	b10.1	1.609	.302	a29.129
	{ Average.....	16	3.2	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158
Less than Av. Per Cent of Measles.	{ Jan....	16	3.5	15.28	15.93	90	1.25	.78	10.90	75	b3.52	b3.85	10.2	a1.283	a.332	a29.278
	{ July...	10	3.5	a20.68	a70.95	b 71	a5.95	3.72	7.96	b 45	b3.15	b3.04	b 7.3	.451	.105	a29.166
	{ Oct....	4	5.0	14.58	a46.01	b 76	3.05	1.91	9.77	67	4.33	4.31	10.1	a.933	a.217	29.070
	{ Dec....	3	4.0	11.28	30.73	83	1.92	1.20	10.48	73	4.57	5.05	12.0	d.940	a.223	29.143
	{ Sept...	3	4.6	a20.33	a58.20	b 74	a4.30	2.69	8.99	b 40	4.40	b4.07	b 8.8	.886	.189	a29.174
	{ Aug...	3	4.8	a20.21	a69.05	b 72	a5.59	3.49	8.19	b 45	b3.77	b .73	b 8.6	.603	.137	29.144
	{ Nov....	2	6.7	13.47	38.73	79	2.49	1.56	10.12	64	b3.61	b3.61	10.2	.801	.206	a29.202
WHOOPING-COUGH.																
More than Av. Per Cent of Whooping-cough.	{ Dec....	12	3.6	a11.28	a30.73	b 83	a1.92	1.20	10.48	b 73	b4.57	b5.05	b12.0	.940	.223	a29.143
	{ April...	11	4.0	18.70	a42.81	69	a2.55	1.59	10.09	47	b4.75	b4.98	b10.6	1.003	.240	29.250
	{ May...	11	4.0	18.04	53.40	71	3.69	2.31	9.37	b 64	b5.57	b5.53	9.1	a.807	a 172	a29.065
	{ March...	11	4.1	17.73	a25.89	b 84	a1.67	1.04	10.64	b 58	4.03	4.27	b11.4	1.062	.228	29.203
	{ Feb....	11	4.3	17.70	a21.65	b 87	a1.51	.94	10.74	b 64	3.65	3.97	b10.1	1.609	.302	a29.129
	{ June...	9	3.0	21.11	68.03	70	5.71	3.57	8.11	43	b5.06	b5.09	8.6	a.609	a.137	a29.069
	{ Jan....	9	3.8	a15.28	a15.93	b 90	a1.25	.78	10.90	b 75	3.52	3.85	b10.2	1.283	.332	29.278
	{ Sept...	9	3.8	20.33	58.20	74	4.30	2.69	8.99	40	b4.40	4.07	8.8	a.886	a.189	29.174
{ Average.....	9	3.9	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158	
Less than Av. Per Ct. of Whooping- cough.	{ Oct....	8	3.6	14.58	a46.01	b 76	3.05	1.91	9.77	67	4.33	4.31	10.1	a.933	a.217	29.070
	{ Nov....	8	3.8	13.47	38.73	79	2.49	1.56	10.12	64	b3.61	b3.61	10.2	.801	.206	a29.202
	{ July...	8	4.4	a20.68	a70.95	b 71	a5.95	3.72	7.96	b 45	b3.15	b3.04	b 7.3	.451	.105	a29.166
	{ Aug....	7	4.3	a20.21	a68.05	b 72	a5.59	3.49	8.19	b 45	b3.77	b3.73	b 8.6	.603	.137	29.144

\* , †, ‡, §, ||, ¶, \*\*. See foot-notes with these marks in Exhibit X., page 119.

a An exception to Proposition 1, relating to Measles and Whooping-cough, on page 131.

b An exception to Proposition 2, relating to Measles and Whooping-cough, on page 131.

## COLD WEATHER DISEASES.

EXHIBIT XXIV.—*Summary Relative to Propositions contained in Exhibits X., XII., XIV., XV., XVI., etc., (pages 119-127) concerning Relations by Months in 1888 between Greater or Less than usual Prevalence of Diseases Named, and Certain given Coincident Climatic Conditions.*

Diseases.	Months (inclusive) in which Diseases named were More than Usually Prevalent in 1888.	Months (inclusive) in which Diseases named were Less than Usually Prevalent in 1888.	For the 12 Months of the Year 1888. Number of Months in which Propositions Hold True.*											
			That in Months when Diseases named were more than usually Prevalent the Conditions named below were Greater than Usual, and in Months when less than Usually Prevalent these Conditions were Less than Usual.							That in Months when Diseases named were more than Usually Prevalent the Conditions named below were Lower than Usual, and in Mos. when the Diseases were Less than Usually Prevalent these Conditions were higher than Usual.				
			For Av. Daily Range of Temp.	Relative Humidity.	Av. Per Cent of Cloudiness.	Ozone.		Atmospheric Pressure.	Range.		Average Temp.	Absolute Humidity.		
						Day.	Night.		Velocity of Wind.	Monthly.			Average Daily.	Average Daily.
Brönchitis. ....	Jan. to May, Nov., Dec. ....	June to Oct. ....	5	10	10	5	6	10	9	9	7	11	10	
Pneumonia. ....	Jan. to May, Dec. ....	June to Nov. ....	6	9	9	7	8	9	10	10	6	10	9	
Membran. Croup	Jan. to May. ....	June to Oct. ....	6	9	9	6	7	9	10	10	6	10	9	
Diphtheria. ....	Jan. to April, Oct. ....	May to Sept., Nov., Dec. ....	5	8	8	5	6	10	11	11	7	9	10	
Tonsilitis. ....	Jan. to April, Nov., Dec. ....	May to Oct. ....	4	11	9	4	5	11	10	10	8	12	11	
Influenza. ....	Jan. to April, Dec. ....	May to Nov. ....	5	10	8	5	6	10	11	11	7	11	10	
Scarlatina. ....	Jan. Feb., Apr. to June, Nov., Dec. ....	March, July to Oct. ....	5	8	8	7	8	8	7	7	7	9	8	
Rheumatism. ....	Jan. to June, Oct. to Dec. ....	July to Sept. ....	5	8	10	8	9	10	9	9	5	9	10	
Neuralgia. ....	Jan. to May, Oct. to Dec. ....	June to Sept. ....	4	9	10	6	7	11	10	10	6	10	11	
Consumption. ....	Jan. to March, May to July. ....	April, Aug., to Dec. ....	8	7	7	4	6	5	6	6	6	6	5	
Pleuritis. ....	Jan. to May, Dec. ....	June to Nov. ....	6	9	9	6	7	9	10	10	6	10	9	

\*The figures in each of these 11 columns show for how many months out of the twelve months in 1888 the proposition named over the column holds true; thus, concerning bronchitis, the proposition relative to average daily range of temperature held true in only five months out of the twelve; that relative to average temperature, in eleven out of twelve, etc.

## TOTAL SICKNESS—AVERAGE DISEASE.

“Average disease” is an average of the tabulated diseases reported present on all the cards received and compiled at this office during the year. It is probably equivalent to the actual sickness from all diseases printed on the report cards, and probably represents very nearly the average sickness from all the diseases in the State. A sample of the report cards on which diseases are reported to this office is found on page 81. Twenty-eight diseases are printed on the cards. In 1888 there were 5,047 of these card reports received. On some of the cards only one or two diseases were reported present; on others twenty or more were reported present. Had each disease (printed on this card, and only the twenty-eight thus named) been reported present on every card received at this office, there would have been 141,316 reports of diseases present. (This is the product of 5,047 reports

## WARM WEATHER DISEASES.

EXHIBIT XXV.—*Summary Relative to Propositions contained in Exhibits XIX., XXI., etc., (pages 132, 134, etc.), concerning Relations, by Months in 1888, between Greater or Less than Usual Prevalence of Diseases named, and certain given coincident Climatic Conditions.*

Diseases.	Months (inclusive) in which Diseases named were More than Usually Prevalent in 1888.	Months (inclusive) in which Diseases named were Less than Usually Prevalent in 1888.	For the 12 Months of the Year 1888, Number of Months in which Propositions Hold True.*											
			That in Months when Diseases named were More Prevalent than Usual the Conditions named below were Higher than Usual, and in Months when the Diseases were less Prevalent than Usual These Conditions were Lower than Usual.						That in Months when Diseases named were More Prevalent than Usual the Conditions named below were Less than Usual, and in Months when the Diseases were Less Prevalent than Usual these Conditions were Greater than Usual.					
			Av. Daily Range of Temp.	Av. Temperature.	Absolute Humidity.		Atmospheric Pressure.		Relative Humidity.	Av. Per Cent of Cloudiness.		Ozone.		Velocity of Wind.
					Monthly.	Av. Daily.	Range.	Average Daily.		Day.	Night.			
Diarrhea.....	July to Sept....	Jan. to June, Oct. to Dec....	7	9	10	3	3	7	8	10	7	8	10	
Chol. Infantum.	July to Sept....	Jan. to June, Oct. to Dec....	7	9	10	3	3	7	8	10	7	8	10	
Intermittent Fev.	May, July to Oct....	Jan. to April, June Nov., Dec..	7	11	10	3	3	5	10	6	5	6	10	
Remittent Fever	Feb., Aug. to Oct....	Jan., Mar. to July, Nov., Dec.	6	8	7	6	6	4	8	7	6	7	7	
Typhoid Fever...	Aug. to Nov....	Jan. to July, Dec.....	4	8	7	4	4	6	7	7	6	7	7	
Typho-mal. Fev..	Aug. to Nov....	Jan. to July, Dec.....	4	8	7	4	4	6	7	7	6	7	7	
Measles .....	Feb. to June....	Jan., July to Dec.....	9	5	6	7	7	5	6	6	5	4	6	
Whooping-cough	Jan'y to June, Sept., Dec....	July, August, Oct., Nov....	8	4	5	8	8	6	5	5	4	5	5	
Av. Disease.....	Feb. to April, Aug., Sept....	Jan., May to July, Oct. to Dec.	9	5	6	8	7	7	7	8	7	8	6	

\* The figures in each of these 11 columns show for how many months out of the twelve months in 1888 the proposition named over the column holds true, thus, concerning diarrhea, the proposition relative to Average Daily Range of Temperature held true in seven months out of the twelve; that relative to Absolute Humidity ten months out of the twelve, etc.

received multiplied by 28, the number of diseases printed on the cards, or 100 per cent of the possible disease reports.) There were actually present on the cards received at this office only 33,270 disease reports which  $33,270 \div 141,316$  of the possible disease reports that might have been present, is 24 per cent. This 24 per cent represents the actual sickness in the State from the tabulated diseases reported present, or in other words the sickness from "average disease." (See Diagram 4, page 129.)

Exhibit XXVI. serves to indicate the probable actual sickness in the State from the tabulated diseases in each year from 1877 to 1887. It compares the sickness in 1888 by months with the sickness by months in each of the eleven years 1877 to 1887.

It will be seen by this exhibit that the sickness reported in 1888 was, for the year, and for each month of the year, less than the average reported for the eleven years 1877-1887.

DIAGRAM 6.—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1888.

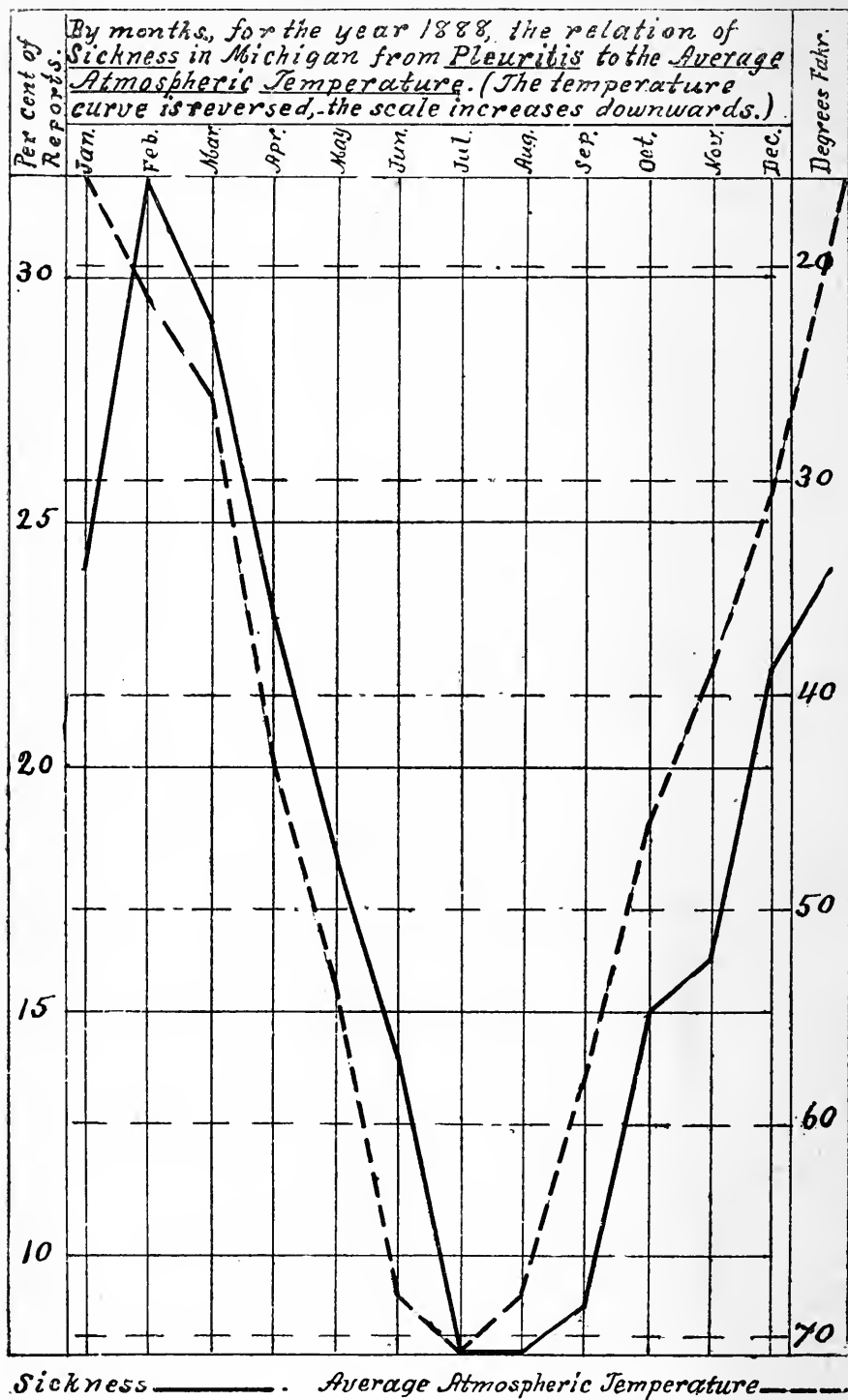


EXHIBIT XXVI.—SICKNESS FROM AVERAGE DISEASE.—1877-87.—*By Year and Months for each of the Twelve Years 1877-88. Stating on an Average for such of the 28 diseases tabulated as were reported present, what Per Cent of the Weekly Reports received stated presence of the Diseases, and comparing the Average Per Cents for Months in 1888 with the Averages for corresponding Months in those Years.*

Years, Etc.	Annual Av.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.
Average 11 years, 1877-87.....	29	30	30	31	30	28	27	29	32	32	30	29	29
1877.....	28	27	28	26	24	24	23	26	29	31	30	30	30
1878.....	30	30	30	31	29	28	26	28	32	35	34	30	32
1879.....	33	35	36	36	35	30	30	32	37	36	34	34	33
1880.....	32	32	32	32	31	30	31	34	36	35	32	30	31
1881.....	33	34	34	32	35	31	30	34	37	36	35	32	31
1882.....	30	31	30	30	30	29	28	28	30	34	32	31	29
1883.....	30	30	31	33	33	31	29	29	32	32	29	29	28
1884.....	29	28	29	30	28	28	29	31	34	34	33	30	29
1885.....	26	29	29	30	28	25	24	26	27	27	26	26	26
1886.....	26	26	26	28	27	26	23	26	27	28	25	25	25
1887.....	25	26	27	28	26	25	24	27	29	26	25	24	24
1888 (Diagram, page 129) .....	24	24	26	27	26	24	23	22	25	25	23	22	23
In 1888 <b>Greater</b> than Av. 1877-87.....	—	—	—	—	—	—	—	—	—	—	—	—	—
In 1888 <b>Less</b> than Av. 1877-87.....	5	6	4	4	4	4	4	7	7	7	7	7	6

#### RELATIONS OF TOTAL AMOUNT OF SICKNESS TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of such of the 28 diseases tabulated (in tables on pages 86-109) as were reported present, the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere, were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of said diseases those conditions were **less** than the average for the year. In Exhibit XXVII., below, the letter *a* marks exceptions to this proposition for the year 1888.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of such of the twenty-seven diseases tabulated as were reported present, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of said diseases those conditions were **greater** than the average for the year. In Exhibit XXVII., below, the letter *b* marks exceptions to this proposition for the year 1888.

What per cent of the weekly reports received in 1888 (on an average for such of the tabulated diseases as were reported present) stated presence of the diseases is graphically represented by months in Diagram 4, page 129.

EXHIBIT XXVII.—AVERAGE DISEASE.—*Stating for the Year and for each Month of the Year 1888, what per cent of the weekly Reports of Sickness on an Average for such of the 28 Tabulated Diseases as were Reported Present, Stated Presence of the Diseases, and what were the Meteorological Conditions as observed at Stations in Michigan.\**

AVERAGE DISEASE.				Temperature, F.		Humidity of Air, \$ Av. of 3 Daily Ob- servations.		Vapor In- haled and Ex- haled from the Air Pas- sages by One Person in 24 Hours. Troy Ounces.		Ozone— Relative Scale of 10°.		Atmospheric Pressure, Inches. Reduced to 32 ° F.						
Months in Order of Great- est Per Cent of Weekly Reports Stating Pres- ence of.				Per Cent of Weekly Reports Stating Presence of,†	Average Order of Prevalence Where Present,‡	Average Daily Range by Registering Thermometers.		Average of Three Daily Observations.	Relative Per Cent. of Saturation.	Absolute,—Grs. of Vapor in a Cubic Foot of Air.	Average Per Cent of Cloudiness.		Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Per Hour by Anemometer.	Range.		
																Monthly and for Year.	Average Daily, by 3 Daily Observa- tions.**	Average Pressure.
More than Av. Pr. Ct. of Av. Disease.	Mar....	27	3.8	17.73	a25.89	b 84	a 1.67	1.04	10.64	b 58	4.03	4.27	b11.4	1.062	.228	29.203		
	Feb....	26	3.9	17.70	a21.65	b 87	a 1.51	.94	10.74	b 64	3.65	3.97	b10.1	1.609	.302	a29.129		
	Apr....	26	3.7	18.70	a42.81	69	a 2.55	1.59	10.09	47	b4.75	b4.98	b10.6	1.003	.340	29.250		
	Aug. . .	25	3.5	20.21	68.05	72	5.59	3.49	8.19	45	3.77	3.73	8.6	a .603	a .137	a29.144		
	Sept....	25	3.6	20.33	58.20	74	4.30	2.69	8.99	40	b4.40	4.07	8.8	.886	a .189	29.174		
Average ...				24	3.5	17.42	45.03	77	3.31	2.07	9.61	57	4.20	4.29	9.8	.916	.207	29.158
Less than Av. Per Cent of Av. Disease.	May....	24	3.6	a18.04	a53.40	b 71	a 3.69	2.31	9.37	64	5.57	5.53	b 9.1	8.07	1.72	29.065		
	Jan....	24	3.7	15.28	15.93	90	1.25	.78	10.90	75	b3.52	b3.85	10.2	a 1.283	a .332	a29.278		
	June ..	23	3.3	a21.11	a68.03	b 70	a 5.71	3.57	8.11	b 43	5.06	5.09	b 8.6	.609	.137	29.069		
	Oct....	23	3.3	14.58	a46.01	76	3.05	1.91	9.77	67	4.33	4.31	10.1	a .933	a .217	29.070		
	Dec....	23	3.3	11.28	30.73	83	1.92	1.20	10.48	73	4.57	5.05	12.0	a .940	a .223	29.143		
	July....	22	3.2	a20.68	a70.95	b 71	a 5.95	3.72	7.96	b 45	b3.15	b3.04	b 7.3	.451	.105	a29.166		
Nov....				22	3.3	13.47	38.73	79	2.49	1.56	10.12	64	b3.61	b3.61	10.2	.801	.206	a29.202

\*, †, ‡, §, ¶, \*\*, See foot-notes with these marks in Exhibit X., page 119.

a An exception to Proposition 1, relating to Average Disease, on page 142.

b An exception to proposition 2, relating to Average Disease, on page 142.

Exhibit XXVII., continued for a series of years, should show what meteorological conditions are on the whole most conducive to health in Michigan, and what are most to be guarded against by residents in Michigan.



LIST OF PUBLICATIONS OF THE STATE BOARD OF HEALTH  
WHICH REMAIN IN PRINT AND MAY BE HAD ON  
APPLICATION.

CIRCULAR LETTER.

Herewith I send you a list of the Annual Reports, and Supplements to the Annual Reports, of the Michigan State Board of Health, and Reprints therefrom, which now remain in print and which we shall take pleasure in supplying to libraries where good use will be made of them, or to "health officers and members of local boards of health and other persons interested in or laboring for the promotion of the public health," as specified in the laws relative to the Annual Reports.

On receipt of the postage indicated, any of these books or pamphlets will be forwarded to the address of such person or library. If it is preferred, they can be sent by express, charges to be paid by those making the request. For convenience in asking for them, the list may be checked or marked opposite the book or pamphlet desired, and the list sent to this office.

Very respectfully,

HENRY B. BAKER, *Secretary.*

Reports and Articles.	Reprint Number	Pages.	Postage, Cts.
First Annual Report, 1873, containing articles and papers as follows:—	-----	101	7
Illuminating Oils in Use in Michigan.....	-----	34-59	-----
Poisonous Paper.....	-----	60-64	-----
School Buildings, in relation to their construction, warming, ventilation, as influencing the health of teachers and scholars.....	-----	65-95	-----
Second Annual Report, 1874, containing articles and papers as follows..	-----	221	11
Entailments of Alcohol.....	-----	1-32	-----
Impurities and Adulterations in Table Syrups, Special Investigation.....	-----	33-40	-----
Draining for Health.....	-----	41-53	-----
Poisonous Paper.....	-----	53-62	-----
The Relation of Schools to Health.....	-----	63-87	-----
Resuscitation of the Drowned.....	-----	88-99	-----
Sanitary Inspection of certain State Institutions.....	-----	101-114	-----
Cerebro-spinal Meningitis.....	-----	115-193	-----
Meteorology of Central Michigan.....	-----	195-213	-----

Reports and Articles.	Reprint Number.	Page.	Postage, Cts.
Third Annual Report, 1875, containing articles and papers as follows:—		170	10
Local Boards of Health.....		1-10	
The Use of Poisons in Agriculture.....		11-25	
Trichinæ.....		26-37	
The Influence of Occupations upon Health.....		38-54	
The Disposal of Human Excreta.....		55-77	
Failure to Prevent Deaths believed to have been Preventable.....		81	
Reproduction of Disease Germs.....		82-83	
Illuminating Oils in Michigan.....		87-103	
The Water Supply in its Relation to Health and Disease.....		107-132	
Ozone.....		135-143	
The Influence of Drainage.....		149-160	
Reprints from Fourth Annual Report, 1876:—			
*Outline of Plan of Weekly Reports of Prevalent Diseases.....	1	xxxvii-xlvii	1
*Contributions to the Study of the Cause of Typhoid Fever.....	2	xliv-lxv	1
*Means of Escaping from Public Buildings in case of Fire.....	3	17-20	1
*Some Facts and Figures concerning the Advisability of Vaccination, etc.....	4	23-40	1
*Report to the State Board of Health, Relative to an Epidemic of Scarlet Fever, at North Lansing, Mich., in 1875-6.....	5	43-52	1
*Report to the State Board of Health on the Water Supply of Michigan.....	10	109-119	1
*Report on Methods of Collecting Vital Statistics.....	11	123-130	1
*Ventilation of Railroad Cars.....	12	133-140	1
*Relative to Diseases in Michigan During the year 1875.....	13	143-178	2
Fifth Annual Report, 1877, containing articles and papers as follows:—		503	17
*Heredity.....	17	1-19	1
*Labeling Medicines.....	18	23-26	1
*Recreations.....	19	29-46	1
*Healthful Dwellings.....	20	49-67	1
Illuminating Oils in Michigan.....		71-90	
Report of Proceedings of the Department of Health of the American Social Science Association at its Annual Meeting Sept., 1877.....		93-98	
*Remarks on Infant Diet.....	23	101-104	1
Small-pox in the City of Detroit.....		107-109	
Baths and Bathing.....		113-130	
Persistence in Efforts to Resuscitate the Drowned.....		133-142	
The Water-Supply of Localities in Michigan.....		145-166	
*Diseases in Michigan during the year 1876.....	23	169-233	3
Diseases in Michigan in 1875.....		233-236	
*Weekly Reports of Diseases in Michigan during the Fiscal Year ending with September, 1877.....	29	239-350	3

\* Supplements to Annual Reports and Reprints from them and from the Annual Reports marked thus (\*) are in pamphlet form, and may be had separate from the volumes from which they are reprints.

PUBLICATIONS OF STATE BOARD OF HEALTH WHICH MAY BE HAD. 145

Reports and Articles.	Reprint Number.	Page.	Postage, Cents.
*Diphtheria.....	31	353-390	2
*Scarlet Fever.....	32	393-447	2
*American Public Health Association.....	33	451-457	1
A Special Danger on Railroad Tracks.....		461-464	-----
Reprints from Annual Report for 1878:			
*The Work of the State Board of Health.....	36	3-14	1
*Report on Public Health Subjects in the Proceedings of the American Medical Association, at its Annual Meeting June 4-7, 1878.....	37	17-23	1
*Lead Poisoning from use of Tinned, Glazed, and Enameled Ware..	38	27-31	1
*Concerning Tomatoes as a Supposed Cause of Cancer.....	39	35-38	1
*Special Reports of Three Outbreaks of Diphtheria in Localities in Michigan.....	42	77-89	1
*Relative to the Diseases in Michigan during the year 1877.....	43	107-165	2
*The Principal Meteorological Conditions in Michigan during the year 1877.....	45	213-251	2
*Relative to Weekly Reports of Diseases in Michigan, during the year 1877.....	46	253-310	2
*Special Reports and Communications to the Michigan State Board of Health, Relative to Communicable and Preventable Diseases.....	49	lix-lxiii	1
*Outline of Work in the Office of the Michigan State Board of Health during the fiscal year 1878.....	50	ix-xxxv	2
Seventh Annual Report, 1879, containing articles and papers as follows:-----		548	19
*A Historical Review of Legislation relating to the Inspection of Illuminating Oil in Michigan.....	51	3-14d	1
Privies and Water-closets at Railway Stations.....	52	17-24	-----
*Public Health Meetings.....	53	27-44	1
Regulation of the Practice of Medicine.....	54	47-50	-----
*Heating and Ventilating of Private Dwellings and Public Buildings already Constructed.....	55	53-62	1
*Report on Slaughter-houses, Rendering Establishments, etc.....	56	65-80	1
*Sanitary Associations.....	57	83-95	1
Waste of Human Life.....		99-102	-----
*Report of Committee on Epidemic, Endemic, and Contagious Diseases.....	58	105-137	2
Duties and Compensation of a Health Officer.....	59	141-146	-----
*Diseases in Michigan in the year 1878.....	60	149-232	3
*The Reclaiming of Drowned Lands.....	61	235-260	2
Householder's and Physician's Notices of Diseases which Endanger the Public Health.....		263-268	-----
Circular to Health Officers.....		271-273	-----
The Water-Supply of Localities in Michigan, and its Relations to Health and Disease.....	62	281-288	-----
The Powers and Duties of Local Boards of Health.....	63	291-300	-----
Glanders in Man and in Domestic Animals.....	64	303-334	-----
Principal Meteorological Conditions in Michigan during the year 1878.....	65	337-394	-----
*Weekly Reports of Diseases in Michigan, year ending Dec. 28, 1878. Regulations for Examinations in Sanitary Science by the Michigan State Board of Health.....	66	397-508	4
		511-512	-----
Eighth Annual Report, 1880, containing articles and papers as follows:-----		508	19

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*Special Reports relative to Communicable and Preventable Diseases	78	xlviil-lxxxviii	2
Proceedings and Addresses at Sanitary Convention at Detroit:.....	68	1-107	-----
Introduction to subject of Sanitary Conventions.....		3-5	-----
Welcoming Address, by Prof. R. C. Kedzie.....		6	-----
President's Address.....		7-10	-----
Contamination of Drinking-Water by Filtration of Organic Matter through the Soil.....		10-13	-----
Texas Cattle Disease.....		14-15	-----
Methods of Study in Sanitary Science.....		16-20	-----
Light in the Public Schools, etc.....		20-29	-----
The Prevention of Pulmonary Consumption.....		30-39	-----
Sanitary Rewards and Punishments.....		39-46	-----
The Sewerage System of Detroit.....		46-54	-----
Ventilation of Dwelling Houses.....		55	-----
The Principles of Ventilation.....		55-8	-----
Neurasthenia.....		58-61	-----
The Use of Household Filters for Potable Waters.....		61-9	-----
Sanitary Progress and Ventilation.....		69-72	-----
The City of Destruction, Yellow Fever at Memphis.....		72-81	-----
The Improvement of Memphis.....		81-2	-----
Supply of Milk in Cities.....		82-6	-----
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Proceedings and Addresses at Sanitary Convention at Grand Rapids:	69	109-185	-----
President's Address.....		115-120	-----
General Sanitation,—Its Importance, and a Plea for Better Methods.....		120-135	-----
Duty of the Christian in Respect to the Laws of Health.....		136-140	-----
Sewerage of the City of Grand Rapids.....		140-3	-----
Prevention Better than Cure.....		143-5	-----
Air-Moistening.....		146-8	-----
The Relation of the Clergy to Sanitary Reform.....		150-6	-----
Cooking.....		156-9	-----
Sewerage at the State Public School.....		160-6	-----
Health of the Young as affected by the School.....		166-176	-----
Conditions of Inflammability.....		176-183	-----
Unsanitary Conditions in Public Schools.....		185-190	-----
*The Causation of Intermittent Fever.....	70	191-212	1
Emanations from Decaying Wood, a Cause of Disease.....		213-220	-----

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Mode of Ventilating a Room Heated by a Coal-stove.....	72	263-6	-----
Examinations in Sanitary Science.....	73	267-76	-----
Ozone in Nature.....	74	277-84	-----
Atmospheric Ozone and the Best Methods for its Observation.....	75	285-302	-----
Meteorological Conditions in Michigan in 1879.....	76	303-363	-----
*Weekly Reports of Diseases in Michigan in 1879.....	77	365-469	4
Ninth Annual Report, 1881, containing articles and papers as follows : ..		501	17
*Proceedings and Addresses at Sanitary Convention at Flint.....	79	1-83	3
Mayor's Welcoming Address.....		5-6	-----
Introductory Address.....		6-9	-----
Opening Address.....		9-15	-----
*Domestic Sanitation.....	80	16-25	1
Some Thoughts on Sewerage and its Adjuncts.....		26-29	-----
On Intemperance as a Cause of Destruction of Human Life.....		30-31	-----
Sanitation and Christianity.....		31-38	-----
Some of the Dangers to Health Pertaining to Pioneer Life.....		38-44	-----
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Plan for a Board of Health for the city of Detroit.....		54-61	-----
Forests and Trees as Sanitary Factors.....		61-68	-----
Report on the Diphtheria in the Michigan Institution for the Education of the Deaf and Dumb.....		71-74	-----
Report of the Grand Rapids Sanitary Association.....		75-77	-----
Is the Grade-work of our Public Schools in its Nature and Require- ments Detrimental to the Health of the Pupils?.....		78-83	-----
Proceedings and Addresses at Sanitary Convention at Battle Creek	82	85-183	-----
Welcoming Address.....		87-89	-----
Address, by D. C. Jacokes, D. D.....		90-93	-----
President's Address.....		93-94	-----
*Legal and Other Measures for the Prevention of Casualties.....	83	95-104	1
Compensating Conditions in the Causation of Sickness.....		104-107	-----
*The Systematic Study of Causes of Sickness and Deaths.....	84	107-125	1
*The Sanitary Relations of a Single Point in the New Physiology of Alcohol.....	85	126-135	1
Personal Sanitary Responsibilities.....	86	136-142	-----
Consumption: Is it a Contagious Disease? What can be done to prevent its Ravages?.....	87	142-151	-----
Nostrums in their Relations to the Public Health.....	88	151-160	-----
Some of the Evils which result from the free and injudicious ad- ministration of Nostrums to Infants and Young Children.....	89	160-164	-----
Report of a Special Committee on Criminal Abortion.....		164-168	-----
*The Health Service of a State.....	90	169-179	1
Sanitary Rules versus Medical Theories.....	91	179-184	-----

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Report on Epidemic, Endemic, and Contagious Diseases.....		201-204	.....
Restriction and Prevention of Diphtheria.....		205-210	.....
Restriction and Prevention of Scarlet Fever.....		211-218	.....
Contagious Diseases, General Rules for their Prevention and Restriction.....		219-220	.....
*Relation of Preventable Sickness to Taxation.....	93	221-226	1
Report on Public Health—American Social Science Association.....		227-229	.....
To Exclude Contagious Diseases from Schools.....		230-231	.....
Sanitary Science Examinations.....		232-236	.....
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Relative to Sugars and Syrups.....		242-248	.....
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Diseases in Michigan in 1880.....		252-288	.....
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Weekly Reports of Diseases in Michigan in 1880.....	94	305-402	.....
*Meteorological Conditions in Michigan in 1880.....	95	403-407	3
Tenth Annual Report, 1882, containing articles and papers as follows:—		592	20
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What Can the Law Do for the Health of the People?.....	97	7-15	.....
*Hygiene in Relation to the Eye.....	98	15-21	1
Care of Health a Christian Duty.....	99	21-25	.....
*How to Combat Small-pox.....	100	26-36	1
The Ambulance Hospital for Small-pox.....		37-43	.....
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The Purification of Water by Freezing.....	102	48-50	.....
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Hygiene and the Clerical Profession.....	104	54-61	.....
Unsanitary Methods and Results of School-work.....	105	61-100	.....
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Ventilation.....	108	108-116	.....
Some Meteorological Aspects of Ventilation.....	109	116-122	.....
*Sanitary Condition of Hospitals of the University of Michigan.....	110	124-135	1
Sanitary Condition of Grand Rapids.....	111	135-138	.....

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Water Supply of Greenville, etc.....	115	153-55	-----
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*How to Obtain and Preserve the Best Eyesight and Hearing....	119	175-184	1
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*Vaccination.....	121	190-197	1
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School Hygiene.....	126	217-220	-----
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Verification by the Health Officer of Notices of Diseases Dangerous to the Public Health.....	133	254-256	-----
*Overflowed Lands along the Maple River.....	134	257-261	1
The work of Health Officers and Local Boards of Health in Michigan	-----	262-273	-----
Report of Attendance at Meeting of Ontario Medical Association...	-----	274-276	-----
*Report on Poisons, Explosives, etc.....	135	277-281	1
*Diseases in Michigan in 1881.....	136	282-327	2
Public-Health Subjects before American Social Science Association.	137	328-338	-----
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## REPORT OF ATTENDANCE AT THE MEETING OF THE MICHIGAN BUSINESS MEN'S ASSOCIATION.

WITH SPECIAL REFERENCE TO PUBLIC HEALTH SUBJECTS.

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BY HENRY B. BAKER, M. D., SECRETARY OF THE MICHIGAN STATE  
BOARD OF HEALTH.

The Third Annual Meeting of the Michigan Business Men's Association, at Cheboygan, was called to order by the President, Frank Hamilton of Traverse City, Tuesday, Aug. 7, 1888, at 9:30 A. M.

Dr. Berdan, president of the village, delivered the address of welcome, which was responded to by C. O. Whitney of Muskegon.

The president in his annual address gave a brief capitulation of the progress made since the last annual meeting, and made some recommendations as to the future. Speaking of our present food laws, he said that they "are rendered inoperative largely because there is no proper provision for enforcement. Such laws are weak, too, from the fact that public opinion is not ready to enforce them. \* \* \* I have before made reference to adulterations, and in former addresses more minutely, but am still of the opinion that our efforts in general, of necessity, will be confined to the educational line, where it is made apparent that the public health is endangered by excessive and poisonous adulterations on specific articles. Then there will be ready response and immediate action. I look forward to the time when our State law shall be complete in its methods and the public alive to their best interests."

Mr. Frank Wells presented an able report of the committee on legislation. After referring to the large number of laws which are valueless because of the neglect to pass proper provisions for their enforcement, he directed attention to laws which have been passed for the suppression of adulterations of food, drugs, etc. He spoke of the investigations into adulterations, by chemists, microscopists, and physicists, in Germany, England and the United States, and said: "Legislation beginning in Europe, was adopted in this country, until now nearly every State has some kind of a law to prevent the adulteration of food and medicine. Such action, aided by the press, has undoubtedly diminished greatly this evil, for reports from recent investigators show a greater degree of purity in the articles examined than was shown by those of a decade ago." He alluded to the prize offered by the National Board of Trade for the best essay and draft of an act on food adulteration. The bill based on this essay, which was presented to Congress, failed to pass.

Mr. Wells reviewed the main provisions of this act as follows:

The bill provides in Section 1 for the creation by the general government of a Bureau on Adulteration, consisting of a chief and a proper number of chemists, inspectors and clerks, for which an appropriation is asked of Congress of \$50,000 per annum. Sections 2 and 3 prohibit the manufacture of any adulterated article of food or drugs in any of the states or territories of the United States, or their importation into the country or transportation from one state or territory into another. Section 4 makes it the duty of collectors of customs to have examinations made of all imported foods or drugs, and not to permit such as are found to be adulterated to pass through the custom house. Sections 7 and 8 provide that the Bureau on Adulterations shall make examinations of specimens of food and drugs, collected under its direction in various parts of the country, and shall publish weekly the results of such examinations. It makes it the duty of every district attorney, upon complaint of the Bureau or any collector of customs, to prosecute any one charged by them with violating any provision of the law, and the enforcement of a penalty of \$100 for the first and \$500 for subsequent offenses or imprisonment one year, or both penalties in the discretion of the court. The subsequent sections define what shall be considered adulterations, and likewise give the Bureau power to exempt certain compounds and preparations from time to time which may be commonly recognized as articles of food and are not injurious. This bill, substantially, had been before Congress during several sessions, but, as before observed, it had failed to pass. Several states, among them New York, New Jersey and Massachusetts, had changed their provisions to adapt it to state superintendence and action, and in this form had passed it. The pure food convention again urged it upon the attention of Congress, and adjourned to meet in January, 1888. It will be observed that the bill prohibits the transportation of adulterated foods from one state or territory into another, but fails to provide a method for enforcing such prohibition. It is difficult to see how, under our form of government, such prohibition would be possible. It also provides for the general government exercising authority over the citizens of the states, a power which the constitution expressly reserves to the states themselves. At the session of the pure food convention in January of this year these defects seem to have been discovered and wisely eliminated from the bill. This measure is now the only one prominently before Congress or the states for action. As it now stands, Congress is asked to provide machinery for the inspection of all foods and drugs sought to be imported into the country and the rejection of such as fail to conform to a certain standard of purity. In the territories and other portions of the country under the exclusive jurisdiction of the United States, the system of obtaining samples of foods and drugs from dealers and their analysis and examination is to be adopted, and the parties found guilty of offering for sale impure goods are to be punished by fine or imprisonment or both. Provision is made for the sale of harmless admixtures in packages without restriction, when covered by a label describing their composition. The advocates of the movement earnestly desire the various state legislatures to make laws for their respective states, similar to the one urged upon Congress. By so doing, the states, as well as the territories, would have the food and drugs offered for sale by their merchants under the continual observation of a trained body of experts, whose duty it would be to secure the arrest and punishment of any dealer offering for sale impure goods illegally. The propriety of embodying in law the foregoing plan is now before the people of the United States for their judgment. Associations like ours are asked to consider the bill, and, if satisfied with its provisions, to do what they can to aid its passage by both the national and state legislatures.

Your committee are in full sympathy with the objects sought to be accomplished by this measure. They deem it wise that the national government should in some way prevent or restrict the importation of adulterated goods into the United States, and know of no objection to the methods for securing that result embodied in this bill. They are not, however, confident of the wisdom of measures intended to punish merchants whom it may be claimed are illegally offering for sale adulterated goods. The bill we have described proposes to do this after having discovered the guilty by means of the system of espionage provided for. A merchant may be called upon at any time to explain how goods claimed to be below a certain standard of purity came into his possession and, failing to do so in a satisfactory manner, be severely punished. Your Committee believe that a law to accomplish the end in view should be popular with all classes but the dishonest. The penal clause of the one we have been considering, even if well guarded and administered by high minded and skillful officials, might be quite annoying to business men and would surely become extremely obnoxious to them if administered by officials of opposite characteristics. If it seems probable that this would be one of the effects of the bill, are we prepared to use such influence as we possess in securing its passage either in the State or the Nation? This question is for you to decide.

Your Committee have considered somewhat a substitute for that part of the bill regarded by them



as objectionable which they think might secure the results desired, with but little disturbance to honest merchants. This substitute is based upon the well-known fact that the motive for adulterating is always gain. If, therefore, you can make fraud of this kind unremunerative it will surely cease. It seems to us that simple exposure must accomplish this as certainly as any other method. Deceit and trickery flourish best in darkness. As the sun rises they retreat, and under the full light of day they disappear. Let the world know just what the articles are which are offered for sale and if they purchase them at all they will only do so at their real value. Give people the names of those manufacturers who undertake to deceive them by misrepresenting the quality of the wares they offer and the products of such manufacturers will remain untouched. If this view is the true one, and we believe your judgment and experience will convince you that it is, is it not the part of wise legislation to require that all articles liable to adulteration should have upon them conspicuous labels; giving the name of the manufacturer, whether the contents are pure or mixed, and if the latter, with what articles and in what proportion? This, when coupled with the provision for examination of articles offered for sale and the publication of the results, seems to us all that need be required to deter manufacturers from dishonest sophistication and merchants from selling impure goods.

In the discussion of this subject, the secretary of this board being called upon to state his opinion whether national legislation, State legislation or the education of the people was principally needed, said that he thought a combination of the three was needed. A good law has educational value. But the greatest good will come from legislation when it is in response to an educated public sentiment.

President Hamilton and others also emphasized the necessity of educating the merchants to see that it is a matter of profit to handle pure food and pure drink, and the people to see how much they lose in health and money by the use of impure food and drink.

Mr. Wells was tendered a rising vote of thanks in appreciation of the thoughtful work put into his report.

Among the other interesting papers presented at this meeting may be mentioned a paper prepared by the late Hon. S. C. Moffatt on the "Business Man of the Future," in which business men were urged to take more interest in legislation and to bear their part of the political and official burden, if they desired a business-like execution of public trusts.

## COMPENSATION OF HEALTH OFFICERS.\*

In March, 1888, the following circular letter was sent to the health officer of every township, village and city in Michigan:

MICHIGAN STATE BOARD OF HEALTH, }  
OFFICE OF ARTHUR HAZLEWOOD, M. D., }  
Grand Rapids, March, 1888. }

*To the Health Officer:*

DEAR SIR—The undersigned is desirous of obtaining direct information from health officers relative to the compensation they receive for the performance of their duties under the law, with the idea of advocating pay or salaries proportionate to the work expected of them and often performed by them. Will you kindly answer the questions on the enclosed postal card and mail at your earliest convenience?

Respectfully,

A. HAZLEWOOD,

*Member of the State Board of Health.*

\*Following this movement, by a committee of this Board, to obtain more facts as to the actual compensation of health officers in Michigan, other articles have been prepared, by the Secretary of this Board bearing upon the subject of the proper compensation; one was read at the Sanitary Convention held at Otsego, and is published in a supplement to this Annual Report (Reprint No. 298), the article itself being reprinted in pamphlet form—No. 301.

The questions asked on the enclosed card were as follows:

1. Do you receive an annual salary as health officer?..... If so, how much?.....
2. What was the amount of bill or bills presented for the health officer's compensation for the year 1887?.....
3. Was any reduction made by the local board or common council?..... How much was allowed and paid?.....
4. How much, in your judgment, should the health officer in your jurisdiction receive for the full and thorough discharge of his duties under the law?.....
5. How well does public opinion in your jurisdiction sustain you in enforcing the health laws of the State?.....
6. What were the several services performed by you as health officer during the year:—
  - How many inspections for nuisances?.....
  - How many nuisances abated?.....
  - How many reports to the State Board of Health?.....
  - How many cases of communicable diseases looked after?.....

Health Officer of.....  
(Township, City or Village.)

.....County of.....Mich.

At the regular meeting of the State Board of Health, held July 10, 1888, Arthur Hazlewood, M. D., member of the Board, made the following report concerning the replies which were received:

*Number of localities in Michigan returning answers to questions in regard to annual salary, compensation and service of health officers in 1887, number of localities where salary and compensation were or were not provided for, total amount provided for in all localities, etc.:*

The number of counties in Michigan is 84; the number of townships, 1,183; the number of cities, 54; the number of villages, 257; the total number of townships, cities and villages is 1,494.

A return postal card with printed questions was sent to each of 1,055 health officers of townships, 213 health officers of villages, and 48 health officers of cities—1,316 localities.

Replies have been received representing 81 counties, as follows: From townships, 551; cities, 20; villages, 104, making only 675 localities from which replies were received out of a total of 1,316 localities to which cards were sent.

The number of localities in which annual salary is provided for is 183, of which number 111 were townships, 18 were cities, and 54 were villages. Compensation is provided for in 13 townships at the rate of from \$1.00 to \$2.00 per day, and in one township, 75 cents per visit.

The amount of annual salaries provided for in the 111 townships is \$1,878.75,—an average of \$16.93 for each township. The amount of annual salaries provided for in the 18 cities\* is \$2,310.00,—an average of \$128.33 for each city. The amount of annual salaries provided for in the 54 villages is \$1,415.25, an average of \$26.21 for each village. In the 13 townships where compensation was per day, 9 provided \$2.00, 3 provided \$1.00 and 1, \$1.50 per day for actual service rendered,—an average of \$1.73 per day for each of the 13 townships. (The general law provides not less than two dollars per day.) The total amount of salaries provided is \$5,604.00—an average of \$30.62 for each of the 183 localities where compensation was by annual salary.

\* For the year 1888, one of the 18 cities has increased the salary of health officer from \$300.00 to \$500.00 per annum.

*Charges* for services rendered, including salaries, were made in 467 localities (out of 675 localities) amounting to \$8,182.88, distributed as follows: In 389 townships,—\$4,512.13—an average of \$11.60 for each township. In 17 cities, \$2,329.00,—an average of \$137.00 for each city. In 61 villages, \$1,341.75,—an average of \$12.00 for each village. In 196 localities no charges were made for services, and in 12 localities where charges *were* made, the amount was either not allowed or is in process of settlement.

*Compensation* for services was allowed and paid in 455 localities as follows: In 376 townships, \$4,299.86; in 18 cities, \$2,382.00; in 61 villages, \$1,170.30, making a total of \$7,852.16. The average amount for each of the 376 townships was \$11.17; for each of the 18 cities, \$132.33 $\frac{1}{3}$ ; for each of the 61 villages, \$19.19, and for each of the 455 localities represented, an average of \$17.25. In 4 localities where no salary was provided for, or charges made for services, an allowance of \$3.00, \$5.00, \$1.00 and \$3.00 respectively was made.

To the question (No. 4 on card) "How much in your judgment should the health officer in your jurisdiction receive for the full and thorough discharge of his duties under the law?" replies were received from 344 townships, stating an aggregate estimated amount of \$12,827.75,—an average of \$37.29 for each township; from 19 cities, an aggregate estimated amount of \$6,300.00,—an average of \$331.58 for each city; from 76 villages the total estimated amount is \$6,165.25, or an average of \$81.12 for each village. The aggregate estimated amount for all localities is \$25,293.00, an average of \$57.62 for each of the 439 localities represented. From the foregoing statements it will be seen that the amount of compensation *allowed* health officers for their services during the year 1887, as compared with the amount they consider a *proper* compensation, was, for health officers of townships, less than one-third, for health officers for cities, a little more than one-third, and for health officers of villages, not quite one-fourth.

Replies were received from 16 persons who were health officers of both townships and villages. Their names appear in the tables, but their replies are not compiled because their statements for township and village are not separated.

#### MODE OF COMPENSATION.

In reply to the same question (No. 4) 72 health officers stated that proper compensation should be a certain sum per day for actual service, the amounts stated averaging \$2.19 per day. One said \$3.00 per visit, and one 50 cents per hour. Forty-six health officers made replies like the following: "According to work performed," "According to circumstances," "For his time," "All he earns," "Pay according to work performed," "Regular fees," "Same rate as physician," "Depends on sickness," etc. Seventy-two health officers who replied to some of the other questions, made no reply whatever to this one, and two considered their services of no value.

#### HOW WELL DOES PUBLIC OPINION SUSTAIN THE WORK?

Replies to question No. 5, "How well does public opinion in your jurisdiction sustain you in enforcing the health laws of the State?" were received from 631 localities. Four hundred and forty-four health officers stated that they were well sustained, 151 that they were poorly sustained, and 36 stated

that "public opinion" did not sustain them at all. Forty-four health officers who replied to some of the other questions made no reply to this one.

#### SERVICES RENDERED BY HEALTH OFFICERS.

To questions included under No. 6, replies were received from 593 localities. The number of nuisances inspected in all localities was 5,075, the number abated was 3,679. The number of reports made to the State Board of Health was 4,029, and the number of outbreaks of communicable diseases looked after was 5,389. The above numbers are only approximate and do not fully show the amount of service performed, because many health officers stated that they had inspected and abated nuisances, sent reports to State Board of Health, and looked after cases of communicable diseases, but had kept no record in either case; therefore, the foregoing numerical statements of work performed are, in each instance, too small; and they represent only 593 out of the 1,494 localities in the State. It is probable, however, that the most active and reliable health officers made reports on this subject, so that it would probably not be safe to assume that those not heard from performed services in the same proportion as did those who reported. On the other hand, the health officers of the two largest cities in Michigan—Detroit and Grand Rapids—did not respond; neither did the following cities: Alpena, Battle Creek, Charlotte, Dowagiac, Eaton Rapids, East Saginaw, Escanaba, Grand Haven, Greenville, Ionia, Manistee, Marquette, Marshall, Mason, Menominee, Monroe, Mt. Clemens, Muskegon, Niles, Owosso, Port Huron, Saginaw City, St. Clair, Stanton, West Bay City, Wyandotte, Ypsilanti, and those 29 cities are not included in this compilation.

The answers returned are but 52 per cent of the inquiries, and of this number (470) 70 per cent only receive compensation by salary or otherwise; judging the localities from which no returns are made—excepting a few of the larger cities—by those that do make returns, it necessarily follows, both from the meagre allowance paid to the health officer, and the reports made in answer to question No. 5, that the people of the State, to a great extent, are yet unwilling to submit to sanitary policing; preferring to run the risk than submit voluntarily to the necessary espionage for prevention, until some communicable disease is in their midst. Such a state of feeling is hardly to be expected among the communities of so enlightened a State as Michigan, but as it exists, and not alone in sparsely settled districts, but in our large cities also, where often corporations and rich property owners are the worst offenders, it seems much work has yet to be done in sanitary conventions and elsewhere to enlighten the people, and convince them, that, although sickness and death are not to be entirely gotten rid of, yet, under proper sanitary conditions, a death rate of less than 9 per 1,000 inhabitants can be maintained as at Pullman, Ill., against the general average of 18+ per thousand—saving an immense sum yearly in the items pertaining to physicians, druggists and undertakers, as well as relief from the untold mental distress attendant upon the premature loss of friends.

The cost need not be great, nor does it need additional legislation. The township or village boards can make a demand upon the people under their jurisdiction for health purposes, spreading a tax upon the rolls not to exceed in townships of 1,000 or more inhabitants ten cents per capita per year. Then no family would be assessed a larger sum than that ordinarily paid to

a physician for one professional visit, and the recommendations of a properly sustained health officer would save quite often an attack of sickness.

By such a light general tax a definite sum could be provided for preventive sanitary measures. The less densely populated townships and villages having the less need and the densely populated ones the more. The varying amount of revenue would permit the more careful and persistent effort as the need became greater.

It would seem that at present some Boards of Health appoint health officers without compensation, relying upon a freedom from communicable diseases, and expecting to pay only the per diem required by law should trouble come among them. This does not fulfill the law, for section 1634, Howell's, expressly states, "The Board of Health shall establish his salary, or other compensation," and the intent of the law is to prevent the introduction of communicable diseases as much as it is to stamp them out if by any untoward event they gain entrance in any given district.

When such an array of facts can be produced, showing the results of careful sanitary work as have been set forth by Dr. O. C. DeWolf concerning the inspection of tenement houses in Chicago, Ill., and by the reports of results in Manchester, Eng., why should Michigan lag behind in this part of her sanitary creed?

ARTHUR HAZLEWOOD.

## COLD-WEATHER DISEASES IN CHILI.

In several papers published in the Annual Reports of this Board\* the fact has been pointed out that most of the diseases of the lungs and air-passages, and also several of those communicable diseases which enter by way of the air-passages, increase after the cold, dry weather, and decrease after warm, moist weather. In an article on the Causation of Pneumonia, Dr. Henry B. Baker, Secretary of this Board, has suggested that pneumonia, one of the most important diseases, would be lessened by securing the proper warming and moistening of all the air breathed in-doors. In the following letter from Hon. Clement Carpenter, ex-Secretary of Legation to Chili, there is apparently evidence as to the increase of all these diseases under conditions the reverse of those recommended—evidence which it would be difficult and perhaps impossible to obtain in this country.

From the following tables, exhibiting the temperature and humidity of the atmosphere in certain parts of Chili in comparison with the same for Michigan, it may be seen that these climatic conditions (which appear to sustain causal relation to the diseases of the lungs and air-passages, and those communicable diseases which enter the body by way of the air-passages), are not so severe in those parts of Chili as they are in Michigan—that the atmosphere is not so cold and dry there as in Michigan; yet from Mr. Carpenter's letter these diseases appear to be more prevalent and fatal

\*"The Causation of Pneumonia," by Henry B. Baker, M. D., Fourteenth Annual Report Mich. State Board of Health, 1886, pp. 246-324.

"The Causation of Cold-weather Diseases," by Henry B. Baker, M. D., Fifteenth Annual Report, Mich. State Board of Health, 1887, pp. 197-211.

"Relations of Certain Meteorological Conditions to Diseases of the Lungs and Air-Passages, as shown by Statistical and Other Evidence" by Henry B. Baker, M. D., Sixteenth Annual Report, Mich. State Board of Health, 1888, pp. 143-169.

in Chili than in Michigan. This is probably, in part at least, due to the greater exposure to which the people of Chili submit themselves by not artificially warming their homes during the winter months (June, July and August).

At any rate the evidence is interesting, and seems to be in harmony with the facts collected in Michigan; because, from a careful study of the facts collected in Michigan, it seems probable that it is the long-continued exposure to the cold dry atmosphere which causes the inflammatory diseases of the air-passages; therefore, if the air in doors, where most people spend at least half their time, is made warm and moist, the conditions are favorable for the prevention of much of the sickness from those diseases.

From the evidence already collected it seems probable that the sickness in Michigan from inflammatory diseases of the air-passages, and from those dangerous communicable diseases which enter by way of the inflamed air-passages, could be greatly lessened by still greater care than is now taken to secure the proper warming and moistening of the air of all houses and other buildings in which our people live and work.

TABLE I.—*Exhibiting the average TEMPERATURE by months for periods of years at each of Four Stations in Chili, South America (Taken from manuscript tables kindly supplied by Gen A. W. Greely, Chief Signal Officer, U. S. A.), compared with the same at the State Agricultural College, near Lansing and near the center of Michigan, for the 22 years, 1864-85.*

Stations.	Annu- al Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Valparaiso, 4 years, 1873-75 and 1886...	56.9	63.1	61.4	59.7	56.9	54.2	50.9	50.5	51.2	53.9	57.2	59.1	64.2
Cochimbo, 4 years, 1873-75 and 1886...	60.1	68.6	67.5	64.1	61.1	56.9	55.3	52.7	55.0	56.0	58.6	61.3	64.4
Copiapó, 4 years, 1873-75 and 1886...	62.1	72.0	70.8	66.9	62.2	57.4	52.7	54.1	55.3	58.9	62.4	65.3	67.4
Santiago, 12 years, 1873-84.....	56.9	68.5	66.8	62.2	56.2	50.3	45.9	46.2	47.2	52.4	57.3	62.9	67.1
Averages.....	59.0	68.1	66.6	63.2	59.1	54.7	51.2	50.9	52.2	55.3	58.9	62.2	65.8
Agricultural Col., Mich., 22 years, 1864-85.....	46.47	21.79	23.81	31.06	45.52	58.10	67.74	71.51	68.78	60.33	48.29	35.36	27.18

TABLE II.—*Exhibiting the average RELATIVE HUMIDITY, by months for periods of years at each of four Stations in Chili, South America (Taken from manuscript tables kindly supplied by Gen. A. W. Greeley, Chief Signal Officer U. S. A.), compared with the same for the State Agricultural College, near Lansing and near the center of Michigan, for the 22 years, 1864-85.*

Stations.	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Valparaiso, 4 years, 1873-75 and 1886...	79	75	78	80	79	81	84	84	80	81	76	76	74
Cuquimbo, 4 years, 1873-75 and 1886...	84	80	81	82	83	86	84	84	84	84	84	85	85
Copiapo, 4 years, 1873-75 and 1886...	64	66	68	65	69	69	68	63	69	60	63	55	57
Santiago, 12 years, 1873-84.....	77	67	69	73	78	82	86	86	85	82	78	71	63
Averages.....	76	72	74	75	77	80	81	79	80	77	75	72	70
Agricultural Coll., Mich., 22 years, 1864-85.....	79	86	86	84	71	69	76	74	77	80	80	82	87

NOTE.—The relative humidity has no known causal relation to any disease, but it is here given for purposes of study, especially as it is so commonly supposed to have such relation. The absolute humidity (shown in Table III.) is believed to have causal relations to all inflammatory diseases of the air-passages, and to several communicable diseases which enter by way of the air-passages.

TABLE III.—*Exhibiting the average ABSOLUTE HUMIDITY by months for a period of years, at four Stations in Chili, South America (Temperature and Relative Humidity being given, reductions were made from tables found in "Smithsonian Meteorological and Physical Tables") compared with the same for 20 years, 1866-85, at the State Agricultural College, near Lansing, and near the center of Michigan.*

Stations.	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Valparaiso, 4 years, 1873-75 and 1886...	4.22	4.85	4.79	4.66	4.20	3.96	3.71	3.65	3.56	3.93	4.08	4.34	4.95
Cuquimbo, 4 years, 1873-75 and 1886...	4.97	6.14	6.01	5.47	5.05	4.58	4.26	3.92	4.22	4.35	4.72	5.20	5.73
Copiapo, 4 years, 1873-75 and 1886...	4.10	5.61	5.58	4.73	4.34	3.73	3.18	3.07	3.50	3.40	3.99	3.81	4.21
Santiago, 4 years, 1873-75 and 1886....	4.11	5.13	5.01	4.59	4.06	3.54	3.23	3.25	3.32	3.79	4.20	4.57	4.61
Averages .....	4.35	5.43	5.35	4.86	4.41	3.95	3.60	3.47	3.65	3.87	4.25	4.48	4.88
Agricultural Coll., Mich., 20 years, 1866-85.....	3.48	1.44	1.53	1.85	2.63	4.02	5.63	6.51	6.01	4.86	3.37	2.19	1.66

LETTER FROM HON. CLEMENT CARPENTER, EX-SECRETARY OF U. S. LEGATION  
AT SANTIAGO, CHILI.

TOLEDO, November 5, 1888.

Dr. Henry B. Baker, Secretary, Michigan State Board of Health, Lansing,  
Mich.:

DEAR SIR—Your kind letter of the 2d inst., requesting me to write you as to the beliefs and superstitions of the people of Chili about the effects of cold, draughts of cold air, and cold-weather diseases is received.

Chili has at present a coast line longer than from Labrador to the southernmost point of Florida, and, of course, has every variety of climate. The winters in the central and southern portion of the country being as severe as with us, yet no amount of argument could persuade its people into heating their houses after our methods, or in fact heating them at all. They will bundle and wrap themselves up in heavy clothing in all manner of ways, yet will avoid a fire as they would a pestilence.

The capital of the country, Santiago, with a population of over two hundred thousand souls, is in a climate much like that of San Francisco. It is nearly two thousand feet above the level of the sea, and in the winter months of June, July and August the weather for weeks at a time is uncomfortably cold, yet there are no stoves and no fire-places except in the few dwellings occupied by foreign residents. A prevalent idea among cultivated people of the country is that a fire continually burning in a room vitiates and destroys the air, and that the habit of sitting by a fire injures the circulation and enervates the system. This idea has full possession of the ladies as of the gentlemen, and a result of its prevalence is a resort to all manner of expedients to keep warm without the presence of a fire. Chilian ladies receive company in rooms cold enough to make one's teeth chatter, and keep warm by means of heavy clothing and constant exercise. Even the lawyers in their offices never have any fires, but sit at their desks in clothing which suggests that they must have taken the very hides off their clients, and with their feet incased in fur rugs and foot warmers lined with fur, with fur caps upon their heads.

It is considered and probably is dangerous and foolhardy either in Peru or Chili to remain in a draught of air any length of time, and in visiting Spanish houses, if one seats oneself between two open doors or windows, his attention will be immediately called to his dangerous position by some one.

In Chili they have a specific disease which they call *Irae*, brought about, as is claimed, entirely by cold draughts of air. It is a kind of paralysis, affecting chiefly the nose and the muscles of the face, and you meet many people disfigured by it.

In the mountains and back from the seas great care is observed in the matter of keeping the body well covered while sleeping during the night-time, and strangers are repeatedly warned that it is dangerous to fail to carefully observe this custom. There is a Spanish saying among people in the country that runs something after this wise: One Spaniard complains to another about his wife, whereupon the person addressed immediately asks why he does not contrive to uncover her feet some night, which is equivalent to asking why he does not take her life.

There are a great many deaths in Santiago every year from consumption, and from the beginning to the end of the winter season diphtheria and small-pox rage there with a violence and an intensity and to an extent that we know nothing about, and have never experienced in this country in cities of like population.

The Santigunas seem to have great fear of throat and lung troubles, and the custom of covering the mouth and nostrils with some soft fabric when in the open air on cold days or nights is universally observed. A Chilano gentleman or lady would never think of drawing the cold air of a keen frosty morning directly into the lungs.



A very singular superstition of the country exists relative to small-pox and headache, to the effect that if one sits in the sun one will be sure to contract the former, and one can avoid and also cure the latter by fastening a leaf on each temple.

Electricity does not manifest itself on the west side of the Cordillera as it does elsewhere, thunder storms are exceedingly rare, the last one in Chili occurring something over 12 years ago. Many doctors resident in South America say that this in some way has much to do with disease and its manifestations; however this may be there is no denying the fact that sickness of every kind there, is more violent in its character than here. Complaints and difficulties here that are treated without the physician and borne by the patient, and not accounted of much moment, are very different and much more painful than with us.

Chili has an enormous death-rate, and probably four-fifths of it among adults is directly brought about by intemperance in the use of intoxicating drinks. There are times in every year in the country during certain periods, that it is impossible sometimes for days for railroad companies and employers of any description to get the laborer to do anything, solely on account of drunkenness. Public works in certain cities have been known to lie idle for several weeks because the laborers were all drunk, and it is a fact thoroughly understood in Santiago and all the northern cities of Chili that it is impossible to get any work done on Monday simply because everybody goes on a spree Saturday night, and no one expects to recover from it until Monday morning. In this matter the women among the laboring classes are as bad as the men. I have walked down the Alameda in Santiago early of a morning after the celebration of some great national festival in commemoration of some battle when it would almost seem as if the battle had just been fought over again and the dead and wounded were lying under my feet. You could count them in groups of tens and twenties, lying indiscriminately, men and women, dead drunk all over the ground.

There are many strange remedies administered for diseases in Chili. Anointing the body with oil, as hot as it can be borne, is a favorite practice for all bowel troubles. Quinine is taken largely as here, but invariably in what would seem to be infinitesimal doses. There is a tea that comes from Patagonia which is used extensively in throat and lung troubles.

The *peons*, or common laboring people, are doctored by a class of soothsayers and charm doctors of their own set who go about among them from house to house, somewhat after the fashion of the voodoo doctors among the darkies of the south.

The medical profession of Chili is, as it ought to be, under strict governmental supervision, the government going so far as to require the physician or surgeon to attend the funerals of his—victims. Sickness or very urgent professional engagements alone constitute a valid excuse for their absence, in which case the physician's buggy and servant follow the hearse. The reason for this regulation is undoubtedly public policy which the world over, in the absence of any other explanation, is held responsible for so many legal enactments.

Respectfully yours,

CLEMENT CARPENTER.

## DIETARIES OF STATE PENAL, REFORMATORY, AND CHARITABLE INSTITUTIONS.

### PRELIMINARY REPORT.

BY ARTHUR HAZLEWOOD, M. D., OF GRAND RAPIDS, MEMBER OF THE STATE BOARD  
OF HEALTH.

*To the President and Members of the State Board of Health :*

GENTLEMEN: At the regular meeting of this Board, held in April last, the secretary presented the following resolution which had been received from the Secretary of the State Board of Corrections and Charities, with the statement that the resolution had been passed by that Board at its March meeting:

*Resolved*, That the State Board of Health be requested to make general inquiry in regard to the dietary of all State penal, reformatory and charitable institutions, with a view to having the food supplied more thoroughly looked over, and request them to report defects, if any, and make such recommendations as in their opinion would make it proper and suitable.

After the reading of the above request, a motion prevailed that the office of the State Board of Health politely request the different institutions of the State to send to the Secretary of this Board their bills of diet, with a statement where the supplies are obtained and what system is used for the inspection of foods.

The answers received from the several State institutions in compliance with the secretary's request were, at the July meeting, turned over to me, in the absence of Dr. Vaughan, for study and report.

The resolution adopted by the State Board of Corrections and Charities contains no specific charge, and therefore one can hardly understand what abuse is aimed at, or in what manner the food supplied should be more thoroughly "looked over," with a view to improvement.

Answers have been received from the following institutions :

The State Prison at Jackson, the Detroit House of Correction, the State Reform School at Lansing, the State Industrial School for Girls at Adrian, the State School for the Deaf at Flint, the State Public School at Coldwater, the Eastern Asylum for the Insane at Pontiac, and the Northern Asylum for the Insane at Traverse City.

The sources from which the food supplies are obtained are given. Some part from the grounds belonging to the institution, and the remainder from merchants. Where the names are given, it is presumable that the supplies are of the quality desired to be purchased by the officer in charge of that department in the particular institution.

Each institution being under the control of officers appointed by the State Government for that purpose, has its own method of administration, and thus we find the food inspected either by the superintendent, matron, steward, store-keeper, or officer detailed for that work, but answerable, so far as I know, to no other authority than the chief of the particular institution.

No mention is made in any of the answers as to the quantity of food given to the inmates, nor of the quality of the cooking. Presuming these to be all that can be desired, the only other question is the appropriateness of the diet as shown by the diet lists. Judging from these alone, it would seem that variety of food and changes in the mode of preparation are well considered in all; but that the School for the Deaf could improve the diet list as given by a more frequent allowance of apples or other fruit in season than once a week affords; and that the Asylums for the Insane at Traverse City and Pontiac would make a more delectable dietary for many by a more liberal use of milk, which might be allowed at one or two meals per day, either as an additional item, or instead of tea, coffee, or cake.

From the evidence which the diet lists afford, it would seem that the most sustaining and complete dietary is provided at the State Prison at Jackson, and the poorest at the two Asylums for the Insane above mentioned; but no positive statement can be made on this or any other point without personal visitation and inspection.

Respectfully submitted,

A. HAZLEWOOD.

## DIET LISTS STATE PENAL, REFORMATORY AND CHARITABLE INSTITUTIONS.

In response to the communications sent to the different State institutions, the following letters and statements have been received:

### MICHIGAN STATE PRISON.

JACKSON, MICH., *May 23, 1888.*

*Henry B. Baker, Secretary State Board of Health:*

SIR—Replying to yours of the 18th, inclosing resolution of the State Board of Charities and requesting a statement of bills of diet for each day and at each season of the year, I have the honor to herewith enclose steward's statement of the present daily bill of fare and also of the consumption of each kind of food during the first month of each quarter.

The steward inspects the food-supply. Any fault, however, reported to warden or deputy would receive prompt attention.

Very respectfully,

H. F. HATCH,  
Warden.

### *Groceries and Provisions Consumed in Steward's Department During the Months of July, October, 1887, January and April, 1888.*

<i>July, 1887.</i>			
Flour .....	29,975 lbs.	Mutton .....	1,290 lbs.
Corn meal.....	640 "	Currants.....	30 "
Yeast .....	31 "	Rice .....	100 "
Milk .....	47,390 "	Potatoes .....	326 bus.
Coffee .....	465 "	Beans .....	17 7-12 "
Sugar .....	825½ "	Onions .....	17 "
Beef.....	8,350 "	Turnips.....	12 "
Salt pork.....	2,200 "	Beans (green).....	51 "
Hominy.....	900 "	Beets.....	123 "
Cod fish .....	1,000 "	Syrup.....	51 gals.
Pepper.....	33½ "	Vinegar .....	140 "
Oat meal.....	640 "	Jelly.....	27 "
Tea.....	256 "	Eggs .....	24 doz.
Butter.....	189¼ "	Ears corn.....	194 "
Crackers.....	125 "	Radishes.....	100 "
Mustard.....	10 "	Salt.....	6 bbls.
		Peas (green).....	55 bus.

*Groceries and Provisions Consumed in Steward's Department—Continued.*

<i>October, 1887.</i>			
Flour .....	30,540 lbs.	Hominy .....	900 lbs.
Corn meal .....	900 "	Pepper .....	45 "
Yeast .....	31 "	Tea .....	42 "
Milk .....	44,480 "	Butter .....	132 "
Coffee .....	465 "	Mustard .....	23 "
Sugar .....	574 "	Graham flour .....	1,568 "
Beef .....	10,000 "	Cod fish .....	600 "
Pork, salt .....	2,160 "	Prunes .....	13 "
Hominy .....	900 "	Pearl barley .....	50 "
Pepper .....	59 "	Split peas .....	10 "
Oat meal .....	450 "	Potatoes .....	215 bus.
Tea .....	234 "	Beans .....	31 "
Butter .....	126 "	Onions .....	15 "
Mustard .....	23 "	Turnips .....	80 "
Cod fish .....	600 "	Carrots .....	25 "
Pearl barley .....	60 "	Parsnips .....	26 "
Dried apples .....	30 "	Rutabagas .....	12 "
Potatoes .....	234 bus.	Beets .....	15 "
Beans .....	25¾ "	Syrup .....	60 gals
Onions .....	20 "	Vinegar .....	45 "
Turnips .....	45 "	Jelly .....	42¾ "
Carrots .....	5 "	Salt .....	2,600 lbs.
Tomatoes .....	20 "	Squash .....	50 doz.
Beets .....	12 "	Cucumber pickles .....	200 "
Bran .....	100 lbs.	<i>April, 1888.</i>	
Syrup .....	43 gals.	Flour .....	27,359 lbs.
Vinegar .....	75 "	Corn meal .....	2,200 "
Jelly .....	30 "	Yeast .....	30 "
Salt .....	6 bbls	Milk .....	27,690 "
Cabbage .....	466 h'ds.	Coffee .....	870 "
Squash .....	25 doz.	Sugar .....	900 "
<i>January, 1888.</i>		Beef .....	8,410 "
Flour .....	26,635 lbs.	Pork, salt .....	2,850 "
Corn meal .....	1,720 "	Hominy .....	800 "
Yeast .....	31 "	Pepper .....	40 "
Milk .....	33,710 "	Salt .....	1,600 "
Coffee .....	882 "	Tea .....	50 "
Sugar .....	970 "	Butter .....	188 "
Beef .....	9,480 "	Mustard .....	10 "
Pork, salt .....	2,980 "	Graham flour .....	3,136 "
		Cod fish .....	795 "

*Groceries and Provisions Consumed in Steward's Department—Continued.*

<i>April, 1888—Continued.</i>			
Pearl barley.....	20 lbs.	Parsnips.....	35 bus.
Currants.....	30 "	Rutabagas.....	24 "
Dried apples.....	20 "	Syrup.....	112 gals.
Beans.....	29½ bus.	Vinegar.....	35 "
Potatoes.....	178 "	Jelly.....	27 "
Beets.....	10 "	Eggs.....	203 doz.
		Cucumber pickles.....	200 "

*The Present Bill of Fare for the Week Ending May 19, 1888.*

<i>Sunday.</i>		<i>Wednesday.</i>	
Breakfast : Hominy.	Dinner : Roast beef.	Breakfast : Same as Monday's.	Dinner : Fresh beef.
Sugar.	Mashed potatoes.		Bean soup.
Bread.	Graham bread.		Mush.
Butter.	Gravy.		Milk.
Coffee.	Supper : Bread, milk and tea.		Bread.
<i>Monday.</i>		<i>Thursday.</i>	
Breakfast : Fresh beef stew with potatoes.	Dinner : Corned beef.	Breakfast : Hominy.	Dinner : The same as Tues- day.
Bread.	Potatoes.	Fried pork.	
Coffee.	Rutabagas.	Syrup.	
	Gravy.	Bread.	
	Milk.	Coffee.	
	Mush.		
	Jelly.		
	Supper : Bread and coffee.		
	The supper is the same every night except Sun- day.	Breakfast : Codfish.	Dinner : The same as Mon- day.
		Potatoes.	
		Pickles.	
		Bread.	
		Coffee.	
<i>Tuesday.</i>		<i>Friday.</i>	
Breakfast : Fried pork.	Dinner : Roast pork.		
Potatoes.	Beans.		
Gravy.	Milk.		
Bread.	Bread pudding.		
Coffee.	Mush.		
		<i>Saturday.</i>	
		Breakfast : The same as Mon- day and Wednes- day.	Dinner : The same as Wed- nesday.

Each convict is compelled to take milk twice a week for dinner. We feed milk to one-third each day, but the rest have a choice of meat or milk, consequently about one-half of the inmates take milk every day.

With milk on Monday, we serve jelly, bread and potatoes.

" " " Tuesday, " " bread pudding and potatoes.

" " " Wednesday " " soup, bread and potatoes.

" " " Thursday, " " corn, " " "

With milk on Friday, we serve jelly, bread and potatoes.

“ “ “ Saturday, “ “ soup, “ “ “

Mush is served with milk every day.

# MICHIGAN STATE REFORM SCHOOL.

LANSING, MICH., May 23, 1888.

*Henry B. Baker, M. D., Secretary Michigan State Board of Health, Lansing, Michigan:*

DEAR SIR—In response to your request of May 18th, allow me to say that we have no cast iron dietary in this institution, and no officer whose special duty it is to inspect all the food for our inmates before it is taken to the kitchen for preparation. In a general way, however, I can, I presume, answer your questions with sufficient definiteness to meet the wishes of your Board.

Six days in the week we have meat (usually beef) for dinner, with vegetables and bread, and water to drink. Five of these six days we have soup—vegetable and meat, and one day we have stewed beans. Our Sunday dinner consists of apple sauce and bread, with cookies. Our breakfast the year round consists of bread and butter and coffee. Our supper is bread and milk the year round, with this exception, that during cold weather we warm and flavor the milk with a little coffee.

This briefly states what our boys have to eat. During the summer time we give them once a day green vegetables—radishes, lettuce, onions, green corn, green peas, etc., in their season.

As to the inspection of the food, the officer of the institution who has charge of our meat room is responsible for knowing that the meat is good. The same officer carries to the kitchen the vegetables and other food, and more than anyone else is expected to have a watchful care as to the quality of everything he takes to the kitchen, and to report anything that is not right.

If on any particular point your Board desire further light, please inform me, and we shall be happy to try and give you full and satisfactory information.

Very truly,

C. A. GOWER,  
*Superintendent.*

# THE STATE INDUSTRIAL HOME FOR GIRLS.

ADRIAN, May 23, 1888.

*State Board of Health, Henry B. Baker, Secretary:*

SIR—I inclose to you, as per request, our dietary. Our vegetables, fruit and eggs are largely raised on the farm. When it is necessary to buy more we find them in the surrounding country. We raise our own milk entirely. Our flour is purchased from the different mills in Adrian three or four times a month, groceries in Detroit, and the cereals often enough to have them fresh. Beef is fattened in the country; we have it brought to us once per week during the winter and twice per week during the summer. We

have a patent cooling-room connected with the ice-house where meat, butter and eggs are preserved in different compartments. We corn our own beef and pork. The various supplies are inspected by the officer who has them in charge. Groceries are given to each family once per week, and the meat daily.

Yours very respectfully,

M. SCOTT.

*Dietary.*

H.

Breakfast.—Coffee, cocoa shells or milk, bread, oatmeal, hash or] warmed potatoes.

Dinner.—Sunday—Cold baked beans, tomatoes, graham bread.

Monday—Beef stew, potatoes, turnips, pickles, corn bread.

Tuesday—Soup, potatoes, crackers, white bread.

Wednesday—Corned beef, cabbage, potatoes, pickles, graham bread.

Thursday—Soup, potatoes, onions, crackers, white bread.

Friday—Fish, vegetables, graham or corn bread, gravy.

Saturday—Bean soup, pickles, white bread.

Pie or pudding once a week.

Supper.—Sunday—Bread, butter, plain cake, milk.

Monday—Rice with sauce, bread, butter.

Tuesday—Graham mush, syrup, bread, butter, tea or milk.

Wednesday—Oatmeal, milk, bread, butter.

Thursday—Corn mush, milk or syrup, bread, butter.

Friday—Tomatoes, bread, butter, tea or milk.

Saturday—Hominy, milk or sugar, bread, butter.

Bread is baked not less than three times a week.

Lettuce, radishes, cucumbers, young onions, corn, peas, string beans, eggs, or fruit (in their season) to be added to either dinner or supper.

DETROIT HOUSE OF CORRECTION.

DETROIT, *May 25, 1888.*

*Henry B. Baker, Secretary State Board of Health, Lansing, Michigan:*

DEAR SIR—Answering your circular letter of 18th inst., I herewith inclose you our present “prison bill of fare,” which is varied with the change of seasons.

I buy everything needed by this institution, and purpose being the judge of the quality of everything received, and its suitableness for the purposes intended. I have no fears about receiving any food unfit for use, nor do I allow any dictation on its preparation; neither have I any fears of epidemics induced by ignorance of proper hygiene precautions. Sewer gas scare has no terrors for me. And am always ready to receive and appreciate practical suggestions on such questions. Will be pleased to furnish you all information in my power any time.

Respectfully yours,

JOS. NICHOLSON,

*Superintendent.*



*Dietary of Detroit House of Correction.*

	Breakfast.	Dinner.	Supper.
Sunday .....	Corn beef hash, corn bread and syrup, coffee.	Roast beef, mashed potatoes, gravy, rice, bread pudding and bread.	Tea and bread.
Monday .....	Prunes, bread and coffee.	Fresh beef stew and bread.	Coffee and bread.
Tuesday .....	Corn beef hash, bread and coffee.	Corn beef, potatoes, turnips, gravy and bread.	Coffee and bread.
Wednesday ..	Fresh beef stew, bread and coffee.	Pork and beans, or peas and bread.	Tea and bread.
Thursday ....	Corn beef hash, bread and coffee.	Fresh beef stew and bread.	Coffee and bread.
Friday .....	Fresh beef hash, bread and coffee.	Corn beef, sauer kraut, potatoes, gravy and bread.	Coffee and bread.
Saturday ....	Corn beef hash, bread and coffee.	Fresh beef stew and bread.	Tea and bread.

## MICHIGAN SCHOOL FOR THE DEAF.

FLINT, MICH., May 25, 1888.

*Henry B. Baker, Secretary, etc., Lansing:*

MY DEAR SIR—In reply to your circular of the 18th inst., I would say that our bill of diet is, perhaps, not so well defined or unvarying as in some institutions. It is, however, pretty regularly administered as follows:

Meat and potatoes once each day.

Fresh or salt fish generally takes the place of meat once a week.

Bread and butter always.

Pie on Sundays.

Cake once each week.

Crackers and cheese once each week.

Biscuits and syrup once each week.

Apples once each week, in season.

Vegetables frequently, in season.

Some kind of sauce once each week.

Oat meal and rice each once each week.

Milk twice each day for the smaller ones; once for the older ones.

Coffee each day for breakfast, water for dinner, tea for the older ones at supper.

All supplies are purchased by the steward under the direction of the board of trustees. He examines and determines upon the quality of goods purchased. The food supplies and dry goods for the institution also come under the examination of the matron.

The meat is purchased, under contract with the board, of parties in Flint.

The coal is purchased, under contract with the board, of parties in Toledo.

The most of the groceries are purchased of parties in Detroit.

The other supplies are generally purchased in Flint.

I shall be very glad to give you any further information you may desire.

Very respectfully,

M. T. GASS.

DIETARIES OF THE EASTERN ASYLUM FOR THE INSANE, AT PONTIAC,  
OF THE NORTHERN ASYLUM FOR THE INSANE, AT TRAVERSE CITY,  
AND THE STATE PUBLIC SCHOOL, AT COLDWATER.

The diet lists for the Eastern Asylum for the Insane and for the Northern Asylum for the Insane were received for every day of the year, and have been studied by members of the Board, although they occupy too much space to be published with this report. The dietary of the State Public School was also received and studied, but it was lost in being transmitted from one member of the Board to another.

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## MODEL DIET TABLES, PREPARED BY ORDER OF THE MICHIGAN STATE BOARD OF HEALTH,

BY VICTOR C. VAUGHAN, PH. D., M. D., PROFESSOR OF HYGIENE AND PHYSIOLOGICAL CHEMISTRY IN MICHIGAN UNIVERSITY, DIRECTOR OF THE STATE HYGIENIC LABORATORY, AND MEMBER OF THE STATE BOARD OF HEALTH.

### FOODS.

Foods may be defined as substances which, when taken into the body, aid in building up or repairing tissues, or, by being oxydized or burned, generate force or energy.

In the growing child a considerable portion of the food is converted into bone, muscle and brain. In the person convalescing from an acute wasting disease, such as typhoid fever, it is plain to see that the increased consumption of food leads to the repair of the tissues which have been reduced by the disease. In all, food is necessary in order to maintain the temperature of the body, and to enable us to put forth either physical or mental effort.

Our ordinary foods consist of certain food-stuffs or alimentary principles, together with a greater or less amount of wholly indigestible substances. Thus, oatmeal is a food containing the food-stuffs, gluten, starch and fat, with a certain amount of cellulose (cell structure) which is excreted unchanged. The nutritive value of a food depends upon the kind and amount of these food-stuffs which it contains. Since no satisfactory discussion of foods can be carried on until we become acquainted with those constituents upon which their values depend, we will briefly consider the food-stuffs. Fortunately these are not numerous, and may be divided into the following classes:

- (1) Albumens or proteids.
- (2) Fats or oils.
- (3) Starches or carbohydrates.
- (4) Inorganic salts.
- (5) Water.

*Albumens or Proteids.*

To this group belong some of the most important food-stuffs. They all contain nitrogen, and for this reason foods rich in these constituents are called "nitrogenous foods." The chief proteids are ordinary albumen, as the white of egg, casein of milk, fibrin of meat, gluten of grains, flour and meal, and legumen of peas and beans. The amount of proteids in the various foods is variable, as will be seen further on.

When we know that the blood, muscles and all the vital organs contain proteids as their chief constituents, we can understand the importance of taking food rich in one or more members of this group. The average workingman requires in his daily food not less than four ounces of pure proteid. The digestive and assimilative organs have the power of converting one proteid into another, but they are not able to form a proteid out of fat or starch. For this reason no other food-stuffs can, without injury, be a substitute for the proteids in our food for any length of time.

*Fats.*

Fats, when oxidized or burned in the body, produce more force than will arise from the combustion of an equal weight of any other food-stuff. In cold countries the inhabitants instinctively consume large amounts of fat on account of the heat which is generated from it. The workingman requires not less than two ounces of fat per day. Fat is best digested when taken in a finely divided form and with some other food.

*Starches or Carbohydrates.*

To this group belong a number of substances of similar chemical composition, and most of them are found most abundantly in vegetable foods. The most important are starch, sugar, gum and dextrine. Like the fats, they are consumed in giving energy to the body, though a much larger amount of the carbohydrates is required to yield the same result. The daily need of this food-stuff to the average workingman is between 17 and 18 ounces. The cellulose or cell structure of plants is closely allied to the members of this group, and any cellulose that is absorbed must first be converted into sugar.

*Mineral Salts.*

The bones of the adult man contain as much as 70 per cent of mineral matter, the greater part of which is phosphate of lime. Smaller quantities of the phosphate of magnesium and the carbonate of lime also exist in bones. The muscles, blood and other tissues contain salts of potash, soda and some iron. One of the most important mineral foods is common salt or the chloride of sodium.

*Water.*

About 70 per cent of the adult body is water. It forms the greater part of the blood, in which it serves as the carrier of other substances, some in solution, others held in suspension. Besides the fluids, the solid tissues contain a greater or less proportion of water; the muscles contain as much

as 75 per cent. There is also a constant loss of water by evaporation from the skin, by exhalation from the lungs, and by excretion from the kidneys and bowels. This loss must be made good by the drinking of water, and by taking foods more or less rich in this constituent.

#### NUTRITIVE VALUE OF FOODS.

The following table, taken from the very valuable work of König, gives the per cents of food-stuffs in our ordinary foods:

##### A.—Animal Foods.

	Proteids. Per Cent.	Fats. Per Cent.	Carbo- hydrates. Per Cent.	Salts. Per Cent.	Water. Per Cent.
Beef, very fat.....	17	26.5	-----	1	55.5
Beef, moderately fat.....	21	5.5	-----	1	72.5
Beef, lean.....	21	1.5	-----	1	76.5
Veal, fat.....	19	7.5	-----	1	72.5
Veal, lean.....	20	1	-----	1	78.0
Mutton, very fat.....	15	36	-----	1	48.0
Mutton, moderately fat.....	17	6	-----	1	76.0
Pork, fat.....	14.5	37.5	-----	1	47.0
Pork, lean.....	20	7	-----	1	72.0
Goose, fat.....	16	45.5	-----	0.5	38.0
Chicken, moderately fat.....	20	4	-----	1	75.0
Game.....	22.5	1	-----	1	75.5
Blood.....	18	0.2	-----	0.8	81.0
Tongue.....	14.5	17	-----	1	67.5
Heart.....	18	8	-----	1	73.0
Lungs.....	15.5	2.5	-----	2	80.0
Kidneys.....	18.5	4	-----	1	76.5
Liver.....	20	4	-----	1.5	74.5
Tallow.....	0.5	98.2	-----	-----	1.3
Lard.....	0.3	99	-----	-----	0.7
Salmon (fresh or canned).....	16	6.5	-----	1	76.5
Salmon (smoked).....	24.2	12.3	-----	12	51.5
Herring (cured).....	19	18.1	-----	16.5	46.4
Cod fish (cured).....	80	1	-----	1.5	17.5
Smoked beef.....	27	15.5	-----	10.5	47.0
Smoked tongue.....	24.5	31.5	-----	8.5	35.5
Cured ham.....	24	36.5	-----	10	29.5
Sausage.....	28.5	40	-----	7	24.5
Blood sausage.....	12	11.5	25	2	49.5
Liver sausage.....	16	26.5	6.5	2.5	48.5

*A.—Animal Foods.—Continued.*

	Proteids. Per Cent.	Fats. Per Cent.	Carbo- hydrates. Per Cent.	Salts. Per Cent.	Water. Per Cent.
Pea sausage.....	16	39.5	29.5	9	6.0
Eggs.....	12.5	12	-----	1	74.5
Woman's milk.....	2.5	4	6	0.5	87.0
Ass' milk.....	2.2	1.6	6	0.5	89.7
Goats' milk.....	3.5	4	4.4	0.8	87.3
Cows' milk (unskimmed).....	3.4	3.6	4.8	0.7	87.5
Cows' milk (skimmed).....	3.1	0.7	4.8	0.7	90.7
Condensed milk (without sugar).....	14.6	14	15.4	2.4	53.7
Condensed milk (with sugar).....	12.2	10.8	49.4	2.3	25.3
Infants' foods.....	12	5	75.0	2	6.0

*B.—Vegetable Foods.*

	Proteids.	Fat.	Carbo- hydrates.	Ash.	Water.	Woody Fiber.
Beans.....	23	2	53.5	3.5	14	4
Peas.....	23	2	52	2.5	15	5.5
Lintels.....	25.5	2	54	3	12	3.5
Rice.....	8	1	76.5	1	13	0.5
Wheat flour (fine).....	10	1	75.2	0.5	13	0.3
Wheat flour (coarse).....	12	1.5	71.5	1	13	1.0
Rye flour.....	11.5	2	69.5	1.5	14	1.5
Oat meal.....	14.5	6	65	2	10	2.5
Buckwheat flour.....	9.5	2	72.5	1.5	13	1.5
Ground peas and beans.....	25	2	56.5	2.5	13	1.0
Starches.....	1	-----	83.6	0.4	15	-----
Macaroni.....	9	0.5	76.5	1	13	-----
Wheat bread (fine).....	7	0.5	55.2	1	36	0.3
Wheat bread (coarse).....	6	0.5	51.9	1	40	0.6
Rye bread.....	6	0.5	49.5	1.5	42	0.5
Hard tack.....	7.5	0.5	52	1.5	37	1.5
Potatoes.....	2	-----	20.7	1	75.5	0.8
Beets.....	1	-----	9	1	88	1
Spinach.....	2.5	0.5	6	2	88	1
Asparagus.....	2	-----	2.5	0.5	94	1
String beans.....	3	-----	6.5	0.5	89	1
Green peas.....	6.4	0.5	12.1	1	78	2
Green beans.....	5.5	0.5	7	1	84	2
Fresh fruit.....	0.5	-----	10	0.5	85	4
Dried fruit.....	2.5	1	55	1.5	30	10

In order for a food to be of value it must not only contain food-stuffs, but these must be presented in a digestible form. The appearance, odor and taste of a food influence the digestion by stimulating or retarding, as the case may be, the flow of the digestive juices. We all know that a good piece of meat is often rendered worthless by improper cooking.

### *Volume of Food.*

It is also desirable that the volume of the food taken should be large enough to satisfy the appetite, and still not so great as to prove burdensome. For this reason foods poor in certain food-stuffs are usually taken with some other food rich in these constituents. Thus, the potato, which contains not more than two per cent of proteids, is usually eaten with meat, which contains from fourteen to twenty-one per cent of proteids; or we may say with equal propriety that because the meat contains no starch, man has learned to take with it the potato whose chief constituent is starch. If one should attempt to live upon potatoes only, the weight of the food that he would have to take each day in order to get the minimum quantity of proteid upon which life could be sustained would not be less than ten or twelve pounds. Dr. Edward Smith actually found some of the poorest Irish laborers confined almost exclusively to potatoes and consuming the amount given above. This would lead to distension of the digestive organs and render one dull and stupid. The digestive organs of plant eating animals form from fifteen to twenty per cent of the entire body weight. In flesh eating animals these organs form only from five to six per cent of the body weight. In man the proportion is from seven to eight per cent. Thus, man, upon this point at least, holds an intermediate position between flesh eating and plant eating animals, being more closely allied to the former than to the latter. However, as the proper cooking of the food aids digestion, man may digest some of the vegetable foods even more quickly and completely than the ox can. But his food should not consist wholly of vegetable products.

### *Cost of Food.*

In the following table, the amounts given refer to the raw food. The prices are average retail figures, and when food is bought in quantity the cost of the daily ration will be much reduced. Any variation in price from the figures given should be noted and a corresponding correction made in the footing. Tables similar to these were prepared by the writer three years ago,\* and have been extensively followed in prisons, work-houses, asylums, boarding houses and private families with satisfactory results. It will be seen that in each table the various food-stuffs are provided for in proper proportions. Diet tables in which this is not done are never either economical or healthy. The amounts given are those required by a healthy, working adult. To the cost of the raw food, as given in the tables, is to be added the cost of cooking, fuel, keeping the table, and of furnishing seasoning, such as salt, pepper and mustard. Where six or more persons eat together, the cost of the above items, including enough to pay the wages of the cook and waiters, is from 35 to 50 cents per week for each boarder. This increases the daily cost of board by from five to seven cents above the figures given in the tables.

\* Published in "Prize Essays of the American Public Health Association, 1885," pages 27-33.

The small amount of nutritive matter in tea and coffee is not considered. According to the investigations of Mr. Fellows, 224 five-ounce cups of tea beverage are made from one pound of tea, and 45 eight-ounce cups from a pound of coffee. This makes the cost of an ordinary cup of tea, when the leaf sells at 75 cents per pound, about one-third of a cent; and of a cup of coffee, when the berry sells at from 27 to 30 cents per pound, about two-thirds of a cent.

CLASS I.—VERY CHEAP DAILY RATIONS, WITHOUT MEAT, FOR THE WINTER SEASON.

*Class I.—No. 1.*

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
2 oz. oat meal.....	0.29	0.12	1.300	$\frac{1}{2}$	4 cents per lb.
1 pt. milk.....	0.54	0.57	0.760	3	6 cents per qt.
10 oz. bread.....	0.70	0.05	5.52	1 $\frac{1}{2}$	3 cents per lb.
$\frac{1}{2}$ oz sugar.....			0.470	$\frac{1}{4}$	8 cents per lb.
<i>Dinner:</i>					
24 oz. potatoes.....	0.48		4.960	1 $\frac{1}{2}$	60 cents per bu.
1 oz. lard (for cooking the potatoes)*.....		0.99		$\frac{1}{2}$	10 cents per lb.
10 oz. bread.....	0.70	0.05	5.52	1 $\frac{1}{2}$	3 cents per lb.
<i>Supper:</i>					
4 oz. beans.....	0.92	0.08	2.140	1	4 cents per lb.
1 oz. lard*.....		0.99		$\frac{1}{2}$	10 cents per lb.
6 oz. bread.....	0.42	0.03	3.31	1 $\frac{1}{2}$	3 cents per lb.
$\frac{1}{2}$ oz. sugar.....			0.470	$\frac{1}{4}$	8 cents per lb.
5 oz. tea, infusion.....				$\frac{1}{2}$	75 cents per lb.
Totals.....	4.05	2.88	24.45	13	

\* The lard, mentioned in these tables, is for cooking.

## Class I.—No. 2.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
2 oz. cheese (toasted).....	0.50	0.58	0.04	1½	12 cents per lb.
10 oz. bread.....	0.70	0.05	5.52	1½	3 cents per lb.
8 oz. coffee decoction.....				¾	27 cents per lb.
<i>Dinner:</i>					
4 oz. beans.....	0.92	0.08	2.14	1	4 cents per lb.
1 oz. lard.....		0.99		¾	10 cents per lb.
10 oz. bread.....	0.70	0.05	5.52	1½	3 cents per lb.
<i>Supper:</i>					
4 oz. rice.....	0.32	0.04	3.06	2	8 cents per lb.
1 pt. milk.....	0.54	0.57	0.76	3	6 cents per qt.
1 oz. sugar.....			0.94	¾	8 cents per lb.
6 oz. bread.....	0.42	0.03	3.31	1½	3 cents per lb.
Totals .....	4.10	2.39	21.29	44½ <sub>6</sub>	

## Class I.—No. 3.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
4 oz. graham flour (or fried mush).....	0.48	0.06	2.86	¾	2 cents per lb.
1 oz. lard.....		0.99		¾	10 cents per lb.
1 oz. sugar (or syrup).....			0.94	¾	8 cents per lb.
8 oz. coffee.....				¾	27 cents per lb.
<i>Dinner:</i>					
1 oz. macaroni.....	0.09		0.76	1½	20 cents per lb.
4 oz. fat cheese.....	1.00	1.16	0.08	3	12 cents per lb.
10 oz. bread.....	0.70	0.05	5.52	1½	3 cents per lb.
<i>Supper:</i>					
16 oz. bread.....	1.12	0.08	8.83	3	3 cents per lb.
16 oz. potatoes (baked).....	0.32		3.31	1	60 cents per bu.
1 pt. milk.....	0.54	0.57	0.76	3	6 cents per qt.
Totals.....	4.25	2.91	23.06	15½ <sub>12</sub>	



## Class I.—No. 4.

Foods.—Quantities.	Proteid. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
2 oz. oat meal.....	0.29	0.12	1.30	½	4 cents per lb.
½ pt. of milk.....	0.27	0.28	0.38	1½	6 cents per qt.
½ oz. sugar.....			0.47	½	8 cents per lb.
1 oz. cod fish.....	0.80	0.01		¾	10 cents per lb.
1 oz. lard.....		0.99		¾	10 cents per lb.
6 oz. bread.....	0.42	0.03	3.31	1½	3 cents per lb.
<i>Dinner:</i>					
4 oz. baked heart.....	0.72	0.32		2½	10 cents per lb.
8 oz. potatoes.....	0.16		1.65	¾	60 cents per bu.
10 oz. bread.....	0.70	0.05	5.52	1½	3 cents per lb.
<i>Supper:</i>					
2 oz. rice.....	0.16	0.02	1.53	1	8 cents per lb.
½ oz. sugar.....			0.47	½	8 cents per lb.
½ pt. milk.....	0.27	0.28	0.38	1½	6 cents per qt.
6 oz. bread.....	0.42	0.03	3.31	1½	3 cents per lb.
<b>Totals.....</b>	<b>4.51</b>	<b>2.13</b>	<b>18.32</b>	<b>13¾</b>	

## Class I.—No. 5.

Foods.—Quantities.	Proteid. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
8 oz. buckwheat flour (as cakes).....	0.76	0.16	5.80	1½	3 cents per lb.
1 oz. sugar.....			0.94	¾	8 cents per lb.
½ oz. lard.....		0.49		¾	10 cents per lb.
8 oz. coffee.....				¾	27 cents per lb.
<i>Dinner:</i>					
4 oz. beans.....	0.92	0.08	2.14	1	4 cents per lb.
½ oz. lard.....		0.49		¾	10 cents per lb.
16 oz. bread.....	1.12	0.08	8.83	3	3 cents per lb.
<i>Supper:</i>					
16 oz. bread.....	1.12	0.08	8.83	3	3 cents per lb.
1 oz. butter.....		0.83		1½	24 cents per lb.
½ pt. milk.....	0.27	0.28	0.38	1½	6 cents per qt.
<b>Totals.....</b>	<b>4.19</b>	<b>2.49</b>	<b>26.92</b>	<b>13¾</b>	

## Class I.—No. 6.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
8 oz. corn meal (as mush) .....	0.78	0.36	5.47	1	2 cents per lb.
1 pt. milk .....	0.54	0.57	0.76	3	6 cents per qt.
<i>Dinner:</i>					
16 oz. potatoes (baked) .....	0.32	-----	3.31	1	60 cents per bu.
4 oz. graham flour (as pudding) .....	0.43	0.06	2.86	$\frac{1}{2}$	2 cents per lb.
$\frac{1}{2}$ pt. milk .....	0.27	0.23	0.38	$1\frac{1}{2}$	6 cents per qt.
$\frac{1}{4}$ oz. sugar .....	-----	-----	0.47	$\frac{1}{4}$	8 cents per lb.
16 oz. bread .....	1.12	0.08	8.83	3	3 cents per lb.
1 oz. butter .....	-----	0.83	-----	$1\frac{1}{2}$	24 cents per lb.
<i>Supper:</i>					
16 oz. bread .....	1.12	0.08	8.83	3	3 cents per lb.
$\frac{1}{2}$ pt. milk .....	0.27	0.23	0.38	$1\frac{1}{2}$	6 cents per qt.
Totals .....	4.90	2.54	31.18	$16\frac{1}{4}$	

## Class I.—No. 7.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
2 oz. rice (as rice cakes) .....	0.16	0.02	1.53	1	8 cents per lb.
1 egg .....	0.12	0.12	-----	$1\frac{1}{4}$	16 cents per doz.
$\frac{1}{4}$ oz. lard .....	-----	0.49	-----	$\frac{1}{4}$	10 cents per lb.
6 oz. bread .....	0.42	0.03	3.31	$1\frac{1}{4}$	3 cents per lb.
1 pt. milk .....	0.54	0.57	0.76	3	6 cents per qt.
<i>Dinner:</i>					
4 oz. beans .....	0.92	0.08	2.14	1	4 cents per lb.
$\frac{1}{2}$ oz. lard .....	-----	0.49	-----	$\frac{1}{2}$	10 cents per lb.
6 oz. bread .....	0.42	0.03	3.31	$1\frac{1}{4}$	3 cents per lb.
<i>Supper:</i>					
2 oz. fat cheese .....	0.50	0.58	0.08	$1\frac{1}{4}$	12 cents per lb.
16 oz. bread .....	1.12	0.08	8.83	3	3 cents per lb.
Totals .....	4.20	2.49	19.96	$13\frac{1}{4}$	

## CLASS II.—VERY CHEAP DAILY RATIONS WITH MEAT.

## Class II.—No. 1.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast :</i>					
2 oz. codfish.....	1.60	0.02	-----	1½	10 cents per lb.
1 oz. lard.....	-----	0.99	-----	1½	10 cents per lb.
6 oz. bread.....	0.42	0.03	3.31	1½	3 cents per lb.
½ pt. milk.....	0.27	0.28	0.38	1½	6 cents per qt.
1 cup of tea, 5-oz.....	-----	-----	-----	¾	75 cents per lb.
¾ oz. sugar.....	-----	-----	0.47	¾	8 cents per lb.
<i>Dinner :</i>					
16 oz. potatoes.....	0.32	-----	3.31	1	60 cents per bu.
1 oz. lard.....	-----	0.99	-----	¾	10 cents per lb.
10 oz. bread.....	0.70	0.05	5.52	1½	3 cents per lb.
<i>Supper :</i>					
10 oz. bread.....	0.70	0.05	5.52	1½	3 cents per lb.
½ pt. milk.....	0.27	0.28	0.38	1½	6 cents per qt.
¾ oz. sugar.....	-----	-----	0.47	¾	8 cents per lb.
2 cups tea, 5-oz. each.....	-----	-----	-----	¾	75 cents per lb.
Totals.....	4.28	2.69	19.36	12½	

## Class II.—No. 2.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast :</i>					
2 oz. fat cheese.....	0.50	0.58	0.04	1½	12 cents per lb.
6 oz. bread.....	0.42	0.03	3.31	1½	3 cents per lb.
1 cup coffee, 8-oz.....	-----	-----	-----	¾	27 cents per lb.
½ pt. milk.....	0.27	0.28	0.38	1½	6 cents per qt.
¾ oz. sugar.....	-----	-----	0.47	¾	8 cents per lb.
<i>Dinner :</i>					
4 oz. beans.....	0.92	0.08	2.14	1	4 cents per lb.
2 oz. bacon.....	0.29	0.75	-----	1½	12 cents per lb.
10 oz. bread.....	0.70	0.05	5.52	1½	3 cents per lb.
<i>Supper :</i>					
1 oz. bread.....	0.70	0.05	5.52	1½	3 cents per lb.
¾ oz. sugar.....	-----	-----	0.47	¾	8 cents per lb.
½ pint milk.....	0.27	0.28	0.38	1½	6 cents per qt.
2 cups coffee, 8 oz. each.....	-----	-----	-----	1½	27 cents per lb.
Totals.....	4.07	2.10	18.23	14½	

## Class II.—No. 3.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
2 eggs.....	0.24	0.24	-----	2½	16 cents per doz.
8 oz. bread.....	0.56	0.04	4.41	1½	3 cents per lb.
1 pt. milk.....	0.54	0.57	0.76	3	6 cents per qt.
1 oz. butter.....	-----	0.83	-----	1½	24 cents per lb.
<i>Dinner:</i>					
2 oz. bacon.....	0.29	0.75	-----	1½	12 cents per lb.
8 oz. turnips.....	0.08	-----	0.72	¼	1 cent per lb.
8 oz. corn meal (as bread).....	0.78	0.36	5.47	1	2 cents per lb.
<i>Supper:</i>					
8 oz. mutton (moderately fat).....	1.36	0.48	-----	8	16 cents per lb.
16 oz. bread.....	1.12	0.08	8.83	3	3 cents per lb.
Totals.....	4.97	3.35	20.19	22½	

## Class II.—No. 4.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
4 oz. fresh fruit.....	0.02	-----	0.40	1	4 cents per lb.
8 oz. bread.....	0.56	0.04	4.41	1½	3 cents per lb.
¼ oz. sugar.....	-----	-----	0.47	¼	8 cents per lb.
1 pt. milk.....	0.54	0.57	0.76	3	6 cents per qt.
1 oz. butter.....	-----	0.83	-----	1½	24 cents per lb.
<i>Dinner:</i>					
4 oz. garden beans.....	0.22	0.02	0.28	1	4 cents per lb.
8 oz. beef (moderately fat).....	1.68	0.45	-----	8	16 cents per lb.
16 oz. bread.....	1.12	0.08	8.83	3	3 cents per lb.
<i>Supper:</i>					
8 oz. corn meal (as mush).....	0.78	0.36	5.47	1	2 cents per lb.
¼ pt. milk.....	0.27	0.28	0.38	1½	6 cents per qt.
Totals.....	5.19	2.43	21.00	21¾	

## Class II.—No. 5.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast :</i>					
2 oz. oat meal.....	0.21	0.12	1.30	$\frac{1}{2}$	4 cents per lb.
$\frac{1}{2}$ oz. sugar .....			0.47	$\frac{1}{4}$	8 cents per lb.
$\frac{1}{2}$ pt. milk.....	0.27	0.28	0.38	$1\frac{1}{2}$	6 cents per qt.
2 oz. sausage (best quality).....	0.57	0.80		$1\frac{1}{2}$	12 cents per lb.
1 cup tea, 5-oz.....				$\frac{1}{2}$	75 cents per lb.
8 oz. bread.....	0.56	0.04	4.41	$1\frac{1}{2}$	3 cents per lb.
<i>Dinner :</i>					
4 oz. beans.....	0.92	0.08	2.14	1	4 cents per lb.
1 oz. bacon.....	0.14	0.37		$\frac{1}{4}$	12 cents per lb.
8 oz. bread.....	0.56	0.04	4.41	$1\frac{1}{2}$	3 cents per lb.
<i>Supper :</i>					
1 oz. bread.....	0.70	0.05	5.52	2	3 cents per lb.
1 oz. butter .....		0.83		$1\frac{1}{2}$	24 cents per lb.
$\frac{1}{2}$ pt. milk .....	0.27	0.28	0.38	$1\frac{1}{2}$	6 cents per qt.
$\frac{1}{2}$ oz. sugar.....			0.47	$\frac{1}{4}$	8 cents per lb.
2 cups tea, 5 oz. each .....				$\frac{3}{4}$	75 cents per lb.
Totals.....	4.28	2.89	19.48	14 $\frac{1}{4}$	

## Class II.—No. 6.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast :</i>					
2 eggs .....	0.24	0.24		$2\frac{1}{2}$	16 cents per doz.
2 oz. codfish.....	1.60	0.02		$1\frac{1}{4}$	10 cents per lb.
10 oz. bread.....	0.70	0.05	5.52	$1\frac{1}{2}$	3 cents per lb.
1 oz. lard.....		0.99		$\frac{1}{2}$	10 cents per lb.
<i>Dinner :</i>					
16 oz. potatoes.....	0.32		3.31	1	60 cents per bu.
1 oz. lard.....		0.99		$\frac{1}{2}$	10 cents per lb.
10 oz. bread.....	0.70	0.05	5.52	$1\frac{1}{2}$	3 cents per lb.
<i>Supper :</i>					
8 oz. corn meal (as mush).....	0.78	0.36	5.47	1	2 cents per lb.
$\frac{1}{2}$ pt. milk.....	0.27	0.28	0.38	$1\frac{1}{2}$	6 cents per qt.
Totals.....	4.61	2.96	20.20	12 $\frac{1}{4}$	

## Class II.—No. 7.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
2 oz. fat cheese .....	0.50	0.58	0.04	1½	12 cents per lb.
10 oz. bread .....	0.70	0.05	5.52	1½	3 cents per lb.
½ pt. milk .....	0.27	0.28	0.38	1½	6 cents per qt.
½ oz. sugar .....			0.47	¾	8 cents per lb.
1 cup coffee, 8-oz. ....				¾	27 cents per lb.
<i>Dinner:</i>					
2 oz. bacon .....	0.29	0.75		1½	12 cents per lb.
4 oz. beans .....	0.92	0.08	2.14	1	4 cents per lb.
8 oz. corn meal (as bread) ..	0.78	0.36	5.47	1	2 cents per lb.
<i>Supper:</i>					
1 oz. bread .....	0.70	0.05	5.52	1½	3 cents per lb.
½ pt. milk .....	0.27	0.28	0.38	1½	6 cents per qt.
Totals .....	4.33	2.43	19.92	12¾	

## CLASS III.—MODERATELY CHEAP DAILY RATIONS.

## Class III.—No. 1.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
4 oz. beef (very fat) .....	0.68	1.06		4	16 cents per lb.
16 oz. potatoes .....	0.32		3.31	1	60 cents per bu.
1 pt. milk .....	0.54	0.57	0.76	3	6 cents per qt.
8 oz. bread .....	0.56	0.04	4.41	1½	3 cents per lb.
<i>Dinner:</i>					
4 oz. beef (moderately fat) ..	0.84	0.22		4	16 cents per lb.
16 oz. potatoes .....	0.32		3.31	1	60 cents per bu.
8 oz. bread .....	0.56	0.04	4.41	1½	3 cents per lb.
<i>Supper:</i>					
2 oz. oat meal .....	0.29	0.12	1.01	¾	4 cents per lb.
½ pt. milk .....	0.27	0.28	0.38	1½	6 cents per qt.
½ oz. sugar .....			0.47	¾	8 cents per lb.
Totals .....	4.38	2.13	18.06	18¾	

## Class III.—No. 2.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
1 oz. cod fish .....	0.80	0.01	-----	¾	10 cents per lb.
16 oz. potatoes.....	0.32	-----	3.31	1	60 cents per bu.
1 oz. lard.....	-----	0.99	-----	¾	10 cents per lb.
8 oz. bread.....	0.56	0.04	4.41	1½	3 cents per lb.
½ pint milk.....	0.27	0.28	0.38	1½	6 cents per qt.
½ oz. sugar.....	-----	-----	0.47	¼	8 cents per lb.
1 cup coffee, 8-oz.....	-----	-----	-----	¾	27 cents per lb.
<i>Dinner:</i>					
8 oz. beef (moderately fat).....	1.68	0.45	-----	8	16 cents per lb.
8 oz. corn meal (as bread).....	0.78	0.36	5.47	1	2 cents per lb.
<i>Supper:</i>					
1 pt. milk.....	0.54	0.57	0.76	3	6 cents per qt.
½ oz. sugar.....	-----	-----	0.47	¼	8 cents per lb.
4 oz. rice.....	0.32	0.04	3.06	2	8 cents per lb.
Totals.....	5.27	2.74	18.33	20 <sup>5</sup> / <sub>12</sub>	

## Class III.—No. 3.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
2 oz. mackerel .....	0.46	0.13	-----	1½	12 cents per lb.
8 oz. bread (as pancakes).....	0.56	0.04	4.40	1½	3 cents per lb.
½ pt. milk.....	0.27	0.28	0.38	1½	6 cents per lb.
1 cup coffee, 8-oz.....	-----	-----	-----	¾	27 cents per lb.
<i>Dinner:</i>					
4 oz. boiled mutton .....	0.68	0.24	-----	3	12 cents per lb.
4 oz. boiled rice.....	0.32	0.04	3.06	2	8 cents per lb.
8 oz. mashed potatoes.....	0.16	-----	1.65	½	60 cents per bu.
8 ounces boiled turnips.....	0.08	-----	0.72	¾	1 cent per lb.
½ pt. milk.....	0.27	0.28	0.38	¾	6 cents per qt.
1 oz. butter .....	-----	0.83	-----	1½	24 cents per qt.
4 oz. bread .....	0.28	0.02	2.20	¾	3 cents per lb.
<i>Supper:</i>					
4 oz. cold mutton.....	0.68	0.24	-----	3	12 cents per lb.
1 oz. bread.....	0.70	0.05	5.52	2	3 cents per lb.
Totals.....	4.46	2.15	18.31	19 <sup>11</sup> / <sub>12</sub>	

## Class III.—No. 4.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
4 oz. fried liver.....	0.80	0.16	-----	2½	10 cents per lb.
1 oz. lard.....	-----	0.99	-----	¾	10 cents per lb.
10 oz. bread.....	0.70	0.05	5.52	1¼	3 cents per lb.
<i>Dinner:</i>					
2 oz. bacon.....	0.29	0.75	-----	1½	12 cents per lb.
8 oz. cabbage.....	0.24	-----	0.64	¾	1 cent per lb.
8 oz. corn meal (as bread).....	0.78	0.36	5.47	1	2 cents per lb.
<i>Supper:</i>					
2 oz. dried fruit (as sance).....	0.05	-----	1.10	1	8 cents per lb.
16 oz. bread.....	1.12	0.08	8.33	3	3 cents per lb.
1 pt. milk.....	0.54	0.57	0.76	3	6 cents per qt.
<b>Totals.....</b>	<b>4.52</b>	<b>2.96</b>	<b>22.32</b>	<b>15</b>	

## Class III.—No. 5.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
4 oz. fresh fruit (berries).....	0.02	-----	0.40	2	8 cents per lb.
10 oz. bread.....	0.70	0.05	5.52	1¼	3 cents per lb.
1 pt. milk.....	0.54	0.57	0.76	3	6 cents per qt.
1 oz. sugar.....	-----	-----	0.94	¾	8 cents per lb.
<i>Dinner:</i>					
2 oz. bacon.....	0.29	0.75	-----	1½	12 cents per lb.
4 oz. string beans.....	0.12	-----	0.26	2	8 cents per lb.
8 oz. corn meal (as bread).....	0.78	0.36	5.47	1	2 cents per lb.
<i>Supper:</i>					
16 oz. bread.....	1.12	0.08	8.83	3	3 cents per lb.
1 pt. milk.....	0.54	0.57	0.76	3	6 cents per qt.
<b>Totals.....</b>	<b>4.11</b>	<b>2.38</b>	<b>22.94</b>	<b>17½</b>	



## Class III.—No. 6.

Foods.—Quantities.	Protelds. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
4 oz. beef.....	0.84	0.22	-----	4	16 cents per lb.
4 oz. bread.....	0.28	0.02	2.20	$\frac{3}{4}$	3 cents per lb.
4 oz. buckwheat (as cakes).....	0.38	0.08	2.90	$\frac{3}{4}$	3 cents per lb.
1 oz. sugar (as syrup and for coffee).....	-----	-----	0.94	$\frac{1}{2}$	8 cents per lb.
$\frac{1}{2}$ pt. milk.....	0.27	0.28	0.38	$1\frac{1}{2}$	6 cents per qt.
1 cup coffee, 8-oz.....	-----	-----	-----	$\frac{1}{2}$	27 cents per lb.
<i>Dinner:</i>					
4 oz. lean mutton.....	0.68	0.24	-----	3	12 cents per lb.
8 oz. bread.....	0.56	0.04	4.41	$1\frac{1}{2}$	3 cents per lb.
16 oz. potatoes.....	0.32	-----	3.30	1	60 cents per bu.
<i>Supper:</i>					
8 oz. bread.....	0.56	0.04	4.41	$1\frac{1}{2}$	3 cents per lb.
1 oz. butter.....	-----	0.83	-----	$1\frac{1}{2}$	24 cents per lb.
1 pt. milk.....	0.54	0.57	0.76	3	6 cents per qt.
Totals.....	4.23	2.39	19.30	19 $\frac{3}{4}$	

## Class III.—No. 7.

Foods.—Quantities.	Protelds. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
2 oz. codfish.....	1.60	0.02	-----	$1\frac{1}{2}$	10 cents per lb.
1 oz. lard.....	-----	0.99	-----	$\frac{1}{2}$	10 cents per lb.
16 oz. potatoes.....	0.32	-----	3.31	1	60 cents per bu.
8 oz. bread.....	0.56	0.04	4.41	$1\frac{1}{2}$	3 cents per lb.
<i>Dinner:</i>					
4 oz. fresh fish.....	0.64	0.23	-----	3	12 cents per lb.
4 oz. corn meal.....	0.39	0.18	2.73	$\frac{1}{2}$	2 cents per lb.
1 egg.....	0.12	0.12	-----	$1\frac{1}{2}$	16 cents per doz.
<i>Supper:</i>					
16 oz. bread.....	1.12	0.08	8.83	3	3 cents per lb.
$\frac{1}{2}$ oz. butter.....	-----	0.41	-----	$\frac{1}{2}$	24 cents per lb.
1 pt. milk.....	0.54	0.57	0.76	3	6 cents per qt.
Totals.....	5.29	2.66	20.04	18 $\frac{3}{4}$	

## CLASS IV.—MORE EXPENSIVE DAILY RATIONS.

*Class IV.—No. 1.*

Foods.—Quantities.	Protids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast :</i>					
2 eggs .....	0.24	0.24	-----	4	24 cents per doz.
8 oz. bread .....	0.56	0.04	4.41	3	3 cents per lb.
1 oz. butter .....	-----	0.83	-----	1½	24 cents per lb.
1 pt. milk .....	0.54	0.57	0.76	4	8 cents per qt.
<i>Dinner :</i>					
1 oz. bacon .....	0.14	0.37	-----	¾	12 cents per lb.
1 oz. string beans .....	0.03	-----	0.06	1	16 cents per lb.
8 oz. mutton .....	1.36	0.48	-----	8	16 cents per lb.
16 oz. potatoes .....	0.32	-----	3.31	1	60 cents per bu.
8 oz. bread .....	0.56	0.04	4.41	3	3 cents per lb.
<i>Supper :</i>					
1 oz. dried fruit .....	0.02	-----	0.55	1¼	20 cents per lb.
1 oz. sugar .....	-----	-----	0.94	¾	8 cents per lb.
1 pt. milk .....	0.54	0.57	0.76	4	8 cents per qt.
8 oz. bread .....	0.56	0.04	4.41	3	3 cents per lb.
Totals .....	4.97	3.18	19.61	35	

## Class IV.—No. 2.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
4 oz. berries.....	0.02	.....	0.40	2	8 cents per lb.
$\frac{1}{2}$ oz. sugar.....	.....	.....	0.47	$\frac{1}{2}$	8 cents per lb.
1 pt. milk.....	0.54	0.57	0.76	4	8 cents per qt.
4 oz. chicken (broiled).....	0.80	0.16	.....	$3\frac{1}{2}$	$12\frac{1}{2}$ cents per lb.
1 oz. butter.....	.....	0.83	.....	$1\frac{1}{2}$	24 cents per lb.
8 oz. bread.....	0.56	0.04	4.41	$1\frac{1}{2}$	3 cents per lb.
1 cup coffee, 8-oz.....	.....	.....	.....	$\frac{3}{4}$	27 cents per lb.
<i>Dinner:</i>					
4 oz. beef.....	0.84	0.22	.....	$3\frac{1}{2}$	14 cents per lb.
2 oz. rice (as croquettes).....	0.16	0.02	1.53	1	8 cents per lb.
1 egg.....	0.12	0.12	.....	$1\frac{1}{2}$	24 cents per doz.
$\frac{1}{2}$ oz. lard.....	.....	0.49	.....	$\frac{5}{16}$	10 cents per lb.
2 oz. macaroni.....	0.18	.....	1.52	$2\frac{1}{2}$	20 cents per lb.
1 oz. fat cheese.....	0.25	0.29	0.02	$\frac{3}{4}$	12 cents per lb.
16 oz. potatoes.....	0.32	.....	3.31	1	60 cents per bu.
4 oz. bread.....	0.28	0.02	2.20	$\frac{3}{4}$	3 cents per lb.
<i>Supper:</i>					
8 oz. bread.....	0.56	0.04	4.41	$1\frac{1}{2}$	3 cents per lb.
$\frac{1}{2}$ pt milk.....	0.27	0.28	0.33	2	8 cents per qt.
Totals.....	4.90	2.98	19.11	$27\frac{5}{6}$	

## Class IV.—No. 3.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
4 oz. beef .....	0.84	0.22	-----	4	16 cents per lb.
1 oz. butter .....	-----	0.83	-----	1½	24 cents per lb.
4 oz. bread .....	0.28	0.02	2.20	¾	3 cents per lb.
½ oz. sugar .....	-----	-----	0.47	¾	8 cents per lb.
1 cup coffee, 8 oz. ....	-----	-----	-----	¾	27 cents per lb.
<i>Dinner:</i>					
2 oz. pork .....	0.29	0.75	-----	1½	12 cents per lb.
2 oz. beans .....	0.46	0.04	1.07	¾	4 cents per lb.
8 oz. potatoes .....	0.16	-----	1.65	¾	60 cents per bu.
2 oz. starch .....	-----	-----	1.67	2	16 cents per lb.
1½ oz. sugar .....	-----	-----	1.41	¾	8 cents per lb.
2 oz. dried fruit .....	0.05	-----	1.11	2½	20 cents per lb.
8 oz. bread .....	0.56	0.04	4.41	1½	3 cents per lb.
<i>Supper:</i>					
4 oz. lean mutton .....	0.68	0.24	-----	4	16 cents per lb.
8 oz. bread .....	0.56	0.04	4.41	1½	3 cents per lb.
½ pt. milk .....	0.27	0.28	0.38	1½	6 cents per qt.
2 cups coffee, 8 oz. each .....	-----	-----	-----	1½	27 cents per lb.
Totals .....	4.15	2.76	18.78	24¾	

## Class IV.—No. 4.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
2 oz. oat meal .....	0.29	0.12	1.30	¾	4 cents per lb.
1 oz. sugar .....	-----	-----	0.94	¾	8 cents per lb.
1 pt. milk .....	0.54	0.57	0.76	3	6 cents per qt.
1 oz. butter .....	-----	0.83	-----	1½	24 cents per lb.
2 oz. mackerel .....	0.46	0.13	-----	1½	12 cents per lb.
4 oz. bread .....	0.28	0.02	2.20	¾	3 cents per lb.
<i>Dinner:</i>					
4 oz. chicken .....	0.80	0.16	-----	4	6 cents per lb.
16 oz. potatoes .....	0.32	-----	3.30	1	60 cents per bu.
8 oz. bread .....	0.56	0.04	4.41	1½	3 cents per lb.
<i>Supper:</i>					
1 pt. milk .....	0.54	0.57	0.76	3	6 cents per qt.
8 oz. bread .....	0.56	0.04	4.41	1½	3 cents per lb.
8 oz. fruit (as sauce) .....	-----	-----	0.80	1	\$1 per bu.
1 oz. sugar .....	-----	-----	0.94	¾	8 cents per lb.
Totals .....	4.35	2.48	19.82	20¾	

## Class IV.—No. 5.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
2 oz. sausage.....	0.57	0.80	-----	2	16 cents per lb.
1 oz. butter.....	-----	0.83	-----	1½	24 cents per lb.
1 oz. sugar.....	-----	-----	0.94	½	8 cents per lb.
1 pt. milk.....	0.54	0.57	0.76	3	6 cents per qt.
4 oz. bread.....	0.28	0.02	2.20	¾	3 cents per lb.
2 cups coffee, 8 oz. each.....	-----	-----	-----	1½	27 cents per lb.
<i>Dinner:</i>					
4 oz. lean beef.....	0.84	0.04	-----	4	16 cents per lb.
16 oz. potatoes.....	0.32	-----	3.30	1	60 cents per bu.
2 oz. macaroni.....	0.18	-----	1.53	2½	20 cents per lb.
8 oz. bread.....	0.56	0.04	4.41	1½	3 cents per lb.
<i>Supper:</i>					
1 pt. milk.....	0.54	0.57	0.76	3	6 cents per qt.
1 oz. sugar.....	-----	-----	0.94	½	8 cents per lb.
8 oz. bread.....	0.56	0.04	4.41	1½	3 cents per lb.
1 cup coffee, 8 oz.....	-----	-----	-----	¾	27 cents per lb.
<b>Totals.....</b>	<b>4.39</b>	<b>2.85</b>	<b>19.25</b>	<b>23¾</b>	

## Class IV.—No. 6.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
4 oz. pork (lean).....	0.80	0.28	-----	3	12 cents per lb.
8 oz. bread.....	0.56	0.04	4.41	1½	3 cents per lb.
½ pt. milk.....	0.27	0.27	0.38	1½	6 cents per qt.
½ oz. sugar.....	-----	-----	0.47	¼	8 cents per lb.
1 cup coffee, 8 oz.....	-----	-----	-----	¾	27 cents per lb.
<i>Dinner:</i>					
2 oz. fat cheese.....	0.50	0.58	-----	1½	12 cents per lb.
16 oz. potatoes.....	0.32	-----	3.31	1	60 cents per bu.
8 oz. bread.....	0.56	0.04	4.41	1½	3 cents per lb.
<i>Supper:</i>					
10 oz. bread.....	0.70	0.05	5.52	2	3 cents per lb.
16 oz. potatoes.....	0.32	-----	3.31	1	60 cents per bu.
½ pt. milk.....	0.27	0.28	0.38	1½	6 cents per qt.
½ oz. sugar.....	-----	-----	0.47	¼	8 cents per lb.
2 cups coffee, 8 oz. each.....	-----	-----	-----	1½	27 cents per lb.
1 oz. butter.....	-----	0.83	-----	1½	24 cents per lb.
<b>Totals.....</b>	<b>4.20</b>	<b>2.37</b>	<b>22.46</b>	<b>18½</b>	

## Class IV.—No. 7.

Foods.—Quantities.	Proteids. Ounces.	Fats. Ounces.	Carbo- hydrates. Ounces.	Cost. Cents.	At the rate of
<i>Breakfast:</i>					
4 oz. cracked wheat.....	0.50	0.07	2.56	¾	4 cents per lb.
½ pt. milk.....	0.27	0.28	0.38	1½	6 cents per qt.
4 oz. cold beef.....	0.84	0.22	-----	4	16 cents per lb.
1 egg.....	0.12	0.12	-----	2	24 cents per doz.
8 oz. potatoes.....	0.16	-----	1.65	¾	60 cents per bu.
1 cup of coffee, 8 oz.....	-----	-----	-----	¾	27 cents per lb.
4 oz. bread.....	0.28	0.02	2.20	¾	3 cents per lb.
<i>Dinner:</i>					
4 oz. roast beef.....	0.84	0.22	-----	4	16 cents per lb.
4 oz. wheat flour (as Yorkshire pudding)....	0.40	0.04	3.00	¾	3 cents per lb.
1 egg.....	0.12	0.12	-----	2	24 cents per doz.
½ pt. milk.....	0.27	0.28	0.38	1½	6 cents per qt.
16 oz. potatoes.....	0.32	-----	3.30	1	60 cents per bu.
<i>Supper:</i>					
8 oz. corn meal (as mush).....	0.78	0.36	5.47	1	2 cents per lb.
1 pt. milk.....	0.54	0.57	0.76	3	6 cents per qt.
<b>Totals.....</b>	<b>4.92</b>	<b>2.26</b>	<b>19.60</b>	<b>23¾</b>	

# COMMUNICABLE DISEASES IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1888.

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COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE STATE BOARD  
OF HEALTH.

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This paper continues a subject treated for the preceding year on pages 222-283 of the Report of the State Board of Health for the year 1888, and for former years in the Reports for those years respectively.

Whenever information is received at this office of the outbreak (in any locality in Michigan) of diphtheria, scarlet fever, typhoid fever, small-pox, measles, whooping-cough, or glanders, a letter is sent to the health officer of the township, city, or village in which the disease is present (if the name of the health officer has been reported to this office; if not, to the president of the Board of Health), calling his attention (if the report was not received from him) to the existence of the disease within his territory, indicating his duties and powers and proper measures to be taken in restricting the disease, transmitting documents of instruction with regard to prevention and restriction of the disease, for distribution among families especially exposed to it,\* and asking for a report of the methods employed for the restriction of the disease, and the results of efforts for suppressing it—and the number of cases and deaths in each outbreak. Except in the cases of typhoid fever, measles, whooping-cough and glanders, for which a special form of letter was employed, the form of the letter generally sent during the year 1888 was substantially the same as that printed on pages 251-252 of the Report of the State Board of Health for the year 1884. With this letter was sent a blank form (L) for notice of the first case of a dangerous communicable disease, a blank form (M) for weekly reports during the continuance of the disease, and a blank form (K) for special final report. Those now in use are substantially the same as those printed on pages 253-254 of the Report for 1884. The blank (K) for final report is printed on pages xiii.-xiv. of the Report of this Board for 1888.

The large number of replies received in answer to communications in regard to contagious diseases, the general desire manifested by health officers for documents on the restriction of communicable diseases, and the general care taken to send complete reports to this office, show an increasing interest among the people, and a commendable effort on the part of the local health authorities to have every means employed to prevent the spread of communicable diseases.

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\*It is believed that these documents distributed in this manner are doing great good; for the neighbors of the sick are sufficiently alarmed to read the documents, and are thus lead to co-operate in stamping out the disease.

Some evidence of the value of this work may be seen further on in this article, under the heads of "Practical Results in Restricting Diphtheria," and "Practical Results in Restricting Scarlet Fever."

TABLE.—*Number of Places in Michigan at which Communicable Diseases were Reported Present During Each Week in 1888.*

Weeks ending:—		Diphtheria.	Scarlet Fever.	Typhoid Fever.	Measles.	Small-pox.	Typhus Fever.
January	7	15	11	9	11	0	0
	14	25	26	20	7	0	0
	21	24	24	10	11	1	0
	28	25	25	15	12	1	0
February	4	22	28	11	21	1	0
	11	18	23	6	16	1	0
	18	19	20	6	17	1	0
	25	14	18	7	17	1	0
March	3	13	11	8	22	0	0
	10	13	20	6	21	1	0
	17	8	21	6	25	1	0
	24	8	21	6	23	1	0
April	31	9	15	7	26	0	0
	7	11	14	6	22	0	0
	14	7	20	7	20	0	0
	21	9	20	5	17	0	0
May	28	8	16	7	26	0	0
	5	7	26	6	28	0	0
	12	6	17	4	29	0	0
	19	9	17	4	32	0	0
June	26	11	17	6	27	1	0
	2	6	18	8	29	1	0
	9	7	17	3	25	3	0
	16	9	15	3	21	1	0
July	23	9	13	5	18	1	0
	30	11	12	6	20	1	0
	7	9	8	5	9	1	0
	14	3	8	5	13	1	0
August	21	9	8	7	9	0	0
	28	10	8	3	3	0	0
	4	11	7	9	3	0	0
	11	13	8	15	4	0	0
September	18	8	10	16	2	0	0
	25	10	14	14	4	0	0
	1	8	13	17	4	0	0
	8	8	11	22	1	0	0
October	15	8	13	15	4	0	0
	22	9	6	18	4	0	0
	29	13	13	18	4	0	0
	6	11	14	22	3	0	0
November	13	14	12	18	4	0	0
	20	17	14	23	4	0	0
	27	17	15	15	4	0	0
	3	13	19	13	5	0	0
December	10	12	24	11	3	0	0
	17	13	20	11	2	1	0
	24	15	16	13	4	1	0
	1	13	18	10	2	5	1
	8	21	18	17	3	5	0
	15	24	29	14	5	5	0
	22	24	17	13	3	6	0
	29	29	23	15	7	4	0
Average per week.....		12.79	16.33	10.65	12.62	.88	.02

## DIPHTHERIA IN MICHIGAN.—YEAR ENDING DECEMBER 31, 1888.

## DISTRIBUTION.

During the year ending December 31, 1888, there were reported to the office of the State Board of Health 337 outbreaks,\* 2,228 cases, and 532 deaths from diphtheria, in 283 localities in Michigan. Of these, 605 cases and 198 deaths occurred in the city of Detroit, and 86 cases and 13 deaths

\* Further on in this article, under the heading "Practical results in restricting diphtheria," the number of outbreaks is stated differently, and a foot note explains the reason why.



in the city of Grand Rapids; leaving 1,537 cases and 321 deaths as having occurred in the State outside of those two cities. From this it may be seen that 31 per cent of all the cases and 40 per cent of all the deaths reported as having occurred in the State during the year 1888 occurred in these two cities; and the greater per cent of fatal cases in these two cities may indicate that diphtheria is more fatal there than in the smaller towns and rural districts, although it is quite possible that this is only apparent because the mild cases in these cities are not reported.

On page 200 is a map of the State of Michigan exhibiting, for each county, the number of localities where diphtheria was reported to have occurred; also the number of outbreaks, cases and deaths which were reported to have occurred in each county during 1888. From this it may be seen that over one-half of all the cases and deaths in the State during the year occurred in six counties as follows: Wayne, 722 cases and 227 deaths; Tuscola, 136 cases, 25 deaths; Kent, 109 cases, 20 deaths; Houghton, 69 cases, 18 deaths; Saginaw, 69 cases, 17 deaths; Eaton, 57 cases, 10 deaths. Total for the six counties, 1,162 cases and 317 deaths.

No reports of diphtheria were received during the year from the following sixteen counties: Baraga, Charlevoix, Delta, Emmet, Iron, Isle Royal, Leelanaw, Luce, Mackinac, Manitou, Missaukee, Montmorency, Oscoda, Otsego, Presque Isle, and Schoolcraft.

Of the 2,228 cases reported in the State during the year, 1,377, or 62 per cent, were reported from the 28 counties in the four southern tiers of counties; and of the 532 deaths reported, 345, or 65 per cent, were reported from the same 28 counties.

The census of 1884 gave the population of the State at 1,853,658, and of these 28 southern counties at 1,158,321, or 62 per cent of the whole population of the State. If we assume that since the census was taken the rate of increase has been the same in all parts of the State, then it would appear from the foregoing that diphtheria in 1888 was very equally distributed between the earlier and later settled portions of the State. But when we consider that the cities of Detroit and Grand Rapids supplied almost one-third of all the cases that were reported in the State, and that these two cities are located in the four southern tiers of counties, and are included in these calculations, it is evident that the northern part of the State had a greater amount of diphtheria, in proportion to its population, than was reported in the southern portion, outside of Wayne and Kent counties. In the four lower tiers of counties, leaving out Wayne county, there were 6.8 cases per 10,000 of the estimated population, while in the rest of the State, north of these four tiers of counties, there were 12.2 cases per 10,000 estimated population, or nearly twice as great as in the older sections of the State. This may be due to a more rapid increase of population in the newer portions of the State than is allowed for in the estimate. The next census must determine that question.

The greater proportion of reported cases of diphtheria in the newer parts of the State may be due to more complete reports by the health officers of those parts of the State. It does seem that the health officers in the new counties are more ready to comply with the comparatively new laws and customs for the restriction of dangerous diseases than are some of the health officers in the oldest portions of the State.



TABLE :—*Exhibiting the Estimated Population of Michigan for the year 1888 by tiers of counties (Upper Peninsula as one tier); also the number of cases of Diphtheria reported from each of these divisions for 1888, and the number of cases per 10,000 estimated population of each division.*

Counties in Groups, most Northern ones First.					Estimated Population, 1888.*	Reported Cases of Diphtheria, 1888.	Average Reported Cases per 10,000 of Estimated Population.
State.					2,162,392	2,228	10.3
Upper Peninsula .....	Alger. Delta. Schoolcraft. Luce. Mackinac. Chippewa. Isle Royal. Keweenaw. Houghton. Ontonagon. Gogebic. Baraga. Marquette. Iron. Menominee.				164,981	278	16.8
Eleventh tier of counties..	Manitou. Emmet. Charlevoix.	Cheboygan. Presque Isle.			47,961	13	2.7
Tenth tier of counties .....	Leelanaw. Antrim. Otsego.	Alpena.			50,030	16	3.2
Ninth tier of counties .....	Montmorency. Benzie. G. Traverse. Kalkaska.	Crawford. Oscoda. Alcona.			45,201	33	7.3
Elghth tier of counties .....	Manistee. Wexford. Missaukee. Roscommon.	Ogemaw. Iosco.			81,968	50	6.1
Seventh tier of counties..	Mason. Lake. Osceola. Clare.	Gladwin. Bay. Huron. Arenac.			161,638	117	7.2
Sixth tier of counties .....	Oceana. Newaygo. Mecosta. Isabella.	Midland.			105,066	63	6.0
Fifth tier of counties .....	Muskegon. Montcalm. Gratiot. Saginaw.	Tuscola. Sanilac.			283,773	281	9.9
Fourth tier of counties .....	Ottawa. Kent. Ionia. Clinton.	Shiawassee. Genesee. Lapeer. St. Clair.			341,745	299	8.7
Third tier of counties .....	Allegan. Barry. Eaton. Ingham.	Livingston. Oakland. Macomb.			226,277	194	8.6
Second tier of counties .....	Van Buren. Kalamazoo. Calhoun. Jackson.	Washtenaw. Wayne.			417,558	798	19.1
First tier of counties .....	Berrien. Cass. St. Joseph. Branch.	Hillsdale. Lenawee. Monroe.			230,160	86	3.7

\* Estimated for each county at the same rate of increase in the four years since 1884 as is shown by the censuses of 1880 and 1884 to have occurred during that four years, 1880-4.

† Deducting the estimated population of Detroit (151,999) for the year 1888 from the estimated population of this tier of counties, and the number of cases of diphtheria (605) which were reported from the city, from the number of cases reported from these counties, we find that there occurred 7.3 cases of diphtheria per 10,000 estimated population in these counties outside of Detroit.

In the city of Detroit, with an estimated population of 151,999, the number of cases per 10,000 population is 39.8.

Estimating the population of the city of Detroit at 250,000 (which is claimed in the monthly report of the health officer), the number of cases of diphtheria reported in the city for the year 1888 would be 24.3 per 10,000 inhabitants.

Both of the foregoing suppositions (page 199) probably apply to this subject with reference to the city of Detroit.

At the same time it must be acknowledged that it is possible that some part of the apparent greater proportion of cases of diphtheria may be due to the newly and sparsely settled townships, not having as well-organized boards of health with as intelligent and active health officers for preventing

or restricting the spread of communicable diseases as have some of the older sections of the State, and it is possible also that the people (largely foreigners) of some of these newer sections are not yet so well educated for successful coöperation with the health officers in this important work.

The facts and considerations at present available are presented for what they are worth; their value will be greater hereafter if they lead to the collection of more facts on this important subject.

#### DIPHTHERIA IN 1888 COMPARED WITH PREVIOUS YEARS.

Comparisons with former years would doubtless be very interesting and instructive, if complete reports had been made to this office, and the method of compiling them had been uniform, but from year to year there has been a steady improvement, both in the methods employed by the office of the State Board of Health for securing reports, and in the efforts made by the local health authorities to furnish this important information to the State Board of Health, and, it is believed that there has also been marked improvement in the method of compiling this information.

The use of the blank form [M] for weekly reports of communicable diseases was begun in May, 1883, which thereafter undoubtedly brought information of cases to this office that otherwise would have failed to reach here. Also, in 1884, for the first time, a search was made through the annual reports, made at the close of the year, to discover whether or not they agreed with the special reports, made during and at the close of outbreaks; and there were found 169 outbreaks of diphtheria in 132 localities with 1,100 cases and 237 deaths which had not been reported by the special reports. These were included in the numbers given in the report for that year, and the annual reports have been used in compiling the communicable diseases for succeeding years. Again, from year to year, the State Board of Health has distributed an increasing number of blanks for reporting communicable diseases, and, also, documents on their restriction and prevention, which contain a copy of the law to the effect that a fine of fifty dollars may be imposed for failing to report a case of a disease dangerous to the public health.

The following table would be very misleading if the above facts were not kept clearly in mind. Thus, although the number of cases of and deaths from diphtheria reported to this office, as given in the following table, steadily increase during the five years from 1882 to 1886 (the last two years, 1887-8, show a marked decrease), it is probable that on account of the great number of documents on the restriction and prevention of diphtheria, which have been distributed, and on account of the increased efforts of health officers to thoroughly isolate patients and disinfect houses, clothing, etc., the actual numbers of cases of and deaths from diphtheria per annum in Michigan are decreasing from year to year.\* This is shown by the weekly reports of the regular correspondents of the State Board of Health (see p. 95 of this Report) which are more uniform and probably the best evidence on this subject yet obtained. These reports show that diphtheria has steadily decreased since 1881, until in 1887 there was reported not quite a third as much as in 1881. However, diphtheria seems naturally to increase and decrease in waves, the crests of which are several years apart, which may largely account for this decrease.

\*See Table and Diagram further on in this article, showing that diphtheria is greatly restricted by these efforts.

TABLE.—DIPHTHERIA IN MICHIGAN: *Numbers of Reported Outbreaks, Localities (in which they occurred), Reported Cases and Deaths, Average Numbers of Cases and Deaths per Outbreak, and the Per Cent of Deaths to Cases, as reported, for each of the Seven Years, 1882-8; also Averages of the same for the Four Years, 1884-7, and Comparisons of the Facts for 1888 with those for 1887, and with the Averages for the Four Years, 1884-7.*

Year.	Reported Outbreaks.	Reported Localities.	Reported Cases.	Average Cases per Outbreak.	Reported Deaths.	Average Deaths per Outbreak.	Per Cent of Deaths to Cases.
1882.....	-----	163	2,040	-----	495	-----	24.
1883*.....	-----	125	2,246	-----	543	-----	24.
1884†.....	362	302	3,915	10.8	905	2.5	23.
1885.....	467	396	4,018	8.6	964	2.	24.
1886.....	550	422	4,244	7.7	982	1.8	23.
1887.....	466	371	3,382	7.3	825	1.8	24.4
1888.....	337	283	2,228	6.6	532	1.6	24.9
Average for four years, 1884-1887.....	461	373	3,890	8.6	919	2.03	23.5
Variations in 1888 from 1887.....	-129	-88	-1,154	-.7	-293	-.19	-.5
Variations in 1888 from the average for four years, 1884-7.....	-124	-90	-1,662	-2.0	-387	-.45	+.4

\* The use of the blank form "M" for weekly reports was begun in May, 1883.

† The use of the annual reports of health officers in compiling diphtheria was begun in 1884.

From the above table, it may be seen that during the year 1888 there were reported 129 outbreaks, 1,154 cases, and 293 deaths less than were reported in 1887. While this decrease is very gratifying, it is still more gratifying to see that there has been a gradual reduction of cases and deaths *per outbreak* each year since 1884.\* In that year the average number of cases per outbreak was 10.8; in 1888 it was 6.6,—a decrease of 4.2 cases per outbreak in 1888 from 1884. The average number of deaths per outbreak in 1884 was 2.5; in 1888 it was 1.6,—a decrease of 0.9 deaths per outbreak in 1888 compared with the year 1884. Multiplying these rates of decrease (4.2 cases and 0.9 deaths) by the number of outbreaks (337) in 1888, indicates 1,415 cases and 303 deaths less in 1888 than there would have been had the average remained the same as in 1884. If the number of outbreaks had been the same in 1888 as in 1884 (*i. e.* 362) the indicated decrease would have been 326 deaths. (The deaths reported to the Secretary of State were 148 less in 1888 than in 1884.)

From the above table, it may be seen that the number of localities in which diphtheria was reported, the number of outbreaks, cases and deaths, and the average number of cases and deaths per outbreak reported in the State were all less in 1888 than in 1887, and much less than the average for the four years, 1884-7. Compared with the average for those four years, it will be seen that for 1888 the reported outbreaks were less by 124, the number of localities was less by 90, the number of cases was less by 1,662, the deaths were less by 387, the average number of cases per

\* The use of the "annual reports of health officers" in compiling diphtheria was begun in 1884.

outbreak was less by 2, and the average number of deaths per outbreak was less by 0.45.

That some part of this decrease in the number of cases and deaths from diphtheria is due to the efforts of the State Board of Health and of the local boards of health to prevent and restrict the spread of diphtheria cannot now be doubted; but diphtheria, when not restricted, decreases and increases in waves, the crests of which, in thickly settled places, occur about four or six years apart, and in sparsely settled districts less frequently. The year 1888 was undoubtedly not the crest of a wave. What proportion of the decrease was due to efforts for the restriction of diphtheria can be better estimated in connection with other facts, further on in this article, under the head of "Practical Results in Restricting Diphtheria."

#### OUTBREAKS OF DIPHTHERIA BY MONTHS IN 1888.

TABLE.—*Exhibiting the number of Outbreaks of Diphtheria beginning and the number ending in each month during the year 1888. (The total number of outbreaks here given is 291, that being all in which the dates of the first and last cases were definitely reported.)*

Outbreaks.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Began (first case taken sick).....	35	29	26	18	22	18	14	15	23	31	25	35
Ended (last case taken sick).....	29	36	31	18	16	12	21	13	15	21	23	56

#### REPORTED SOURCE OF CONTAGION OF DIPHTHERIA.

Of the 337 outbreaks of diphtheria reported in Michigan during the year 1888, 125 health officers said nothing about the source of contagium, 123 reported that it was unknown, 23 attributed it to the unsanitary conditions of the premises, 21 thought that it originated from some former case, and only 45 were able to trace it directly to a former case.

Reported Sources of Diphtheria in 1888.	Number of Outbreaks.
Traced to a former case.....	45
Probably to a former case.....	21
Unsanitary conditions.....	23
Unknown (includes 4 cases reported "sporadic").....	123
Not reported.....	125
All outbreaks.....	337

#### *Diphtheria traced to a former case.*

Below are given a few extracts from local health officers' reports who were able to trace the disease to a former case; with the name of the health officer and of his jurisdiction subjoined:—

"The child came from Ingham county about three weeks ago, stopping over at Vermontville on their way back, where they have the disease." \* \* —*Dr. D. E. Fuller, health officer of the city of Hastings.*

"A young man by the name of B— was visiting friends in an adjoining township, where there was a sick child, proved after to be diphtheria. The young man came home and was taken with the disease in five days."—*Roswell Curtis, health officer, Hagar township, Berrien county.*

"By a lady whose child had diphtheria while visiting in Ohio. She returned here, and clothing had not been disinfected."—*Dr. E. V. Hall, health officer, Tuscarora township, Cheboygan county.*

"Child playing with playthings of a child that had diphtheria in Meredith about one year ago. The playthings had not been in use since child had disease a year ago."—*Dr. P. E. Witherspoon, health officer, Harrison village, Clare county.*

"A family from this place attended the funeral of a friend at Traverse City who died with diphtheria; on returning the children attended school, hence the outbreak here."—*Nelson W. Clark, health officer, Paradise township, Grand Traverse county.*

"A woman from an affected district in Finland visited a family here in which the disease attacked three children one week subsequently, and another family in which one child was attacked." \* \* —*Dr. E. H. Pomeroy, health officer, Calumet township, Houghton county.*

"HENRY B. BAKER, M. D.: Dear sir—Your letter of inquiry about Mrs. A. Bygraves, whom I am treating for diphtheria, is at hand, and in reply I may say that she was not exposed until Jan. 1 and 2, when she visited with a sister from Mason who had recovered from diphtheria four weeks previous, and on Jan. 8, eight days from the first exposure, her throat began to get sore and she was feverish." \* \* \* —*Dr. T. M. Winters, health officer, Dansville village, Ingham county.*

"We have traced it to Ishpeming."—*Dr. J. M. Mead, health officer, Iron Mountain city, Menominee county.*

"The first case was exposed in Detroit."—*Dr. M. W. Gray, health officer, city of Pontiac.*

"The most reasonable theory as to source of first cases of this epidemic is that it was brought from Rockland by a diphtheritic patient recently recovered." \* \* \* —*Dr. J. P. Jordan, health officer, Ontonagon village, Ontonagon county.*

"Was introduced from Bessemer to stage driver."—*Dr. Henry K. Lum, health officer, Rockland township, Ontonagon county.*

"The disease was brought in one family (Coles') by wife's sister who had been at Northville (with relatives who lost a child with same disease) and slept with Coles' wife and baby. Lapse of time from Northville here, six weeks." \* \* —*O. R. Pattengill, health officer, Canton township, Wayne county.*

TABLE.—*Exhibiting the Localities from which Diphtheria was Spread (according to the Official Reports), with the Number of Cases and Deaths, if Reported; the Secondary Localities into which the Disease was said to have been Introduced from the First (with Number of Cases and Deaths). Compiled from Reports by Forty Health Officers who were able to Trace the Source of Contagium to other Localities.*

First Localities from which Diphtheria Spread.	In "First" Localities.		Secondary Localities Infected from "First."	In "Secondary" Localities.	
	Cases.	Deaths.		Cases.	Deaths.
Allegan county: Gun Plain township.....	*	-----	Kalamazoo county: Kalamazoo city.....	1	0
Bay county: Bay City.....	21	5	Genesee county: Flint city.....	9	0
Berrien county: Watervliet village.....	*	-----	Berrien county: Hagar township.....	5	1
Buchanan village.....	*	-----	Lake township.....	1	1
Calhoun county: Marshall city.....	1	0	Calhoun county: Albion city.....	1	1
Clare county: Meredith township.....	*	-----	Clare county: Harrison village.....	1	1
Eaton county: Vermontville village.....	28	5	Barry county: Hastings city.....	2	1
Grand Traverse county: Traverse City.....	*	-----	Grand Traverse county: Paradise township.....	7	1
Houghton county: Calumet township.....	12	3	Houghton county: Lake Linden village.....	1	0
Ingham county: Lansing city.....	17	4	Eaton county: Roxand township.....	3	0
Mason city.....	6	1	Ingham county: Ingham township.....	1	0
Kent county: Gaines township.....	13	1	Kent county: Caledonia township.....	1	0
Lapeer county: Lapeer city.....	8	2	Saginaw county: Frankenmuth township.....	1	1
Lapeer city.....	*	-----	Menominee county: Iron Mountain city.....	6	2
Marquette county: Ishpeming city.....	15	4	Mason county: Riverton township.....	1	0
Mason county: Ludington city.....	10	4	Oceana county: Benona township.....	3	0
Oceana county: Shelby township.....	*	-----	Ontonagon county: Ontonagon village.....	34	2
Ontonagon county: Rockland township.....	7	2	Lapeer county: Rich township.....	1	1
Roscommon county: .....	*	-----	Branch county: Coldwater city.....	2	0
St. Joseph county: Burr Oak township.....	*	-----	Hillsdale county: Hillsdale city.....	2	1
Van Buren county: Lawrenceville village.....	*	-----	Shiawassee county: Owosso city.....	1	0
Washtenaw county: Ann Arbor city.....	3	0	Washtenaw county: Ann Arbor township.....	4	1
Ypsilanti township.....	5	0	Jackson county: Tompkins township.....	2	0
Wayne county: Northville village.....	115	7	Wayne county: Canton township.....	14	2

\* This outbreak was not reported to this office by the Health Officer of the "first" locality at the time it occurred.

† From this locality the contagium was reported as having been carried to Dansville, Ingham County, where two cases occurred. This was the only instance in which the disease was traced to a third locality from a second.



First Localities from which Diphtheria Spread.	In "First" Localities.		Secondary Localities Infected from "First."	In "Secondary" Localities.	
	Cases.	Deaths.		Cases.	Deaths.
Wayne county: Detroit.....	605	198	{ Houghton county: Houghton village..... Oakland county: Pontiac city..... St. Clair county: Riley township.....	1 2 12	0 0 0
"By a young man from the north woods".....	*	-----	Washtenaw county: Superior township.....	19	4
"Introduced from neighboring town".....	*	-----	Houghton county: Osceola township.....	37	9
.....‡ Denmark.....	*	-----	Tuscola county: Gifford township.....	5	1
(OUTSIDE THE STATE.)					
Canada.....			{ Bay county: Bangor township..... Tuscola county: Watertown township.....	5 1	3 0
Chicago.....			{ Allegan county: Douglas village..... Oceana county: Hart village.....	1 4	0 1
Ohio.....			{ Branch county: Coldwater city..... Cheboygan county: Tuscola township.....	3 6	1 3

\* This outbreak was not reported to this office by the Health Officer of the "first" locality at the time it occurred.

‡ County not given.

Health officers who take the trouble to trace a dangerous disease seem also to take sufficient care, and proper measures, to prevent its spread outside their jurisdiction.

In the foregoing table, 13, or 33½ per cent of the "first-locality outbreaks" were not reported to this office as the law requires at the time they occurred. The number of cases which occurred in the localities infected by these 13 localities (which were not reported) was 86, or 42 per cent of all the cases which occurred in the 39 "secondary" localities, and the number of deaths which occurred in these 13 localities was 21, or 54 per cent of all the deaths which occurred in the 39 "secondary" localities.

From the above table and foregoing facts it appears that there occurred 204 cases of diphtheria and 39 deaths that can be attributed to neglect, by the health officers or other persons in the "first localities," to enforce proper restrictive measures.

*Diphtheria outbreaks probably traced to a former case.*

Below are given a few extracts from reports of health officers who probably traced the contagium to a former case.

"The lady who was stricken down did some washing for a family who had been having sore throat, living in Marshall, Mich.—probably diphtheria."—Dr. F. E. Palmer, health officer, Albion city, Calhoun county.

"First case had not been out of town, but lived in the part of the village where most cases occurred two years ago, on our former outbreak—may have been more than two years ago."—Dr. G. E. Corbin, health officer, St. Johns village, Clinton county.

"One case came from Bay City, where this disease is prevailing, and where she is supposed to have taken it. The other case supposes she caught the disease on the cars from a sick child."—*Dr. A. Van der Velpen, health officer, city of Flint.*

"After Dec. 24, 1887, no more cases of diphtheria occurred in the village of Columbiaville until Feb. 10, 1888, when one of the older children of the same family which had it in December last came down with it."—*Dr. C. A. Wisner, health officer, Columbiaville village, Lapeer county.*

"Not positively known, but supposed to have been contracted at a house near by where diphtheria occurred a few months before, which might not have been thoroughly disinfected." [First outbreak.]

"In this case I believe the source of contagium was virus remaining latent in house. Nearly a year ago a child died in the house, of diphtheria. This family moved in about six months after." [Second outbreak.]

"A member of family in house where the disease was prevalent last winter. The house was fumigated, but probably some virus of the disease remained active to cause the outbreak." [Third outbreak.]—*Dr. W. A. Burnham, health officer, Rockland township, Ontonagon county.*

"The patient visited families in which had been diphtheria in the spring. The soil and weather have been favorable for the disease."—*W. Miller, health officer, Casco township, St. Clair county.*

### *Diphtheria attributed to unsanitary conditions.*

The following extracts are taken from the reports of health officers who attribute the outbreaks of diphtheria to unsanitary conditions:

"Stagnant water and defective sewerage." "The family consisted of father, mother, and six children; house contains three rooms; nationality, Swedes; poor living and close confinement may have been aggravating circumstances." "Supposed to have been a well of bad smelling water near the house." "Foul air in house for want of proper ventilation." "Unclean dwelling and habits." "Low water in well." "The source of contagium could not be traced to anything else except the filthy place where the outbreak was." "Impure water and filthy conditions of the back yard." "This outbreak I attribute to a putrid well of water." "A filthy cellar without drainage, and partially filled with water during the entire summer." "Filth of family where first case occurred." "The house is located on low, damp ground. No other cause to be noticed." "All cases of diphtheria that have occurred in the township within the last five years have been near the lower part of the course of Swan Creek, where the water is stagnant and the water vegetation decays for the greater part of the summer." "Chiefly attacked families with unsanitary surroundings."

### DIFFERENCES IN DIAGNOSIS.

Disagreement in diagnosis frequently occurs, in great part due to different views as to what constitutes diphtheria; physicians frequently holding that nothing is diphtheria except when there is actually found diphtheritic necrosis—the so-called false membrane. The accumulated experience with this disease during its extensive history, and the weight of authority seem to indicate that, in the adult, diphtheria is not, as a rule, characterized by the presence of the false membrane, certainly not for any considerable time, so that unless seen just at the right time no patch is found, and when found it is likely to be small. Yet such cases are capable of communicating to children unmistakable diphtheria. Also, irrespective of age, there are "benignant cases" where there is catarrhal manifestation but no membrane

forms;\* and still others where a membrane forms on organs other than those of the throat, and thus escapes detection. These forms of this disease appear to be the most prolific cause of the spread of diphtheria in Michigan. Frequently in such cases the disease is not recognized as anything serious, and a physician is not called, or when one is called the disease being of such a mild form awakens doubts as to its true nature. Whenever there is any question, the patient should be isolated, and disinfection should take place with as much care and thoroughness as if it were a marked case of diphtheria, as diphtheria of even the most malignant type often develops from just such cases.

The following, taken from the reports of local health officers and clerks of local boards of health, received at the office of the Secretary of the State Board of Health, give some of the mistakes that occur under this head:

"The case of *diphtheria* reported this week has a little history. A family living about fifty rods from the residence of the patient was reported as having *scarlet fever*. A little girl of the scarlet fever family was allowed to play with the patient, carrying an old silk handkerchief which had the appearance of having been used by the scarlet fever patient. My little patient was found by its mother using this handkerchief. \* \* \* In five days the disease manifested itself." \* \* \*

"I believe the disease started in a family who lived where it was very wet, water standing all around the house, nearly all the family had sore throat; but Dr. ——— said it was not diphtheria, but might turn to that; the first known case was a hired girl who was carried from there to her home."

"A child of A—— P—— of Burr Oak, four and one-half years old, was stopping for a short time in town, and being taken sick, in a few days died of what Dr. ———, who treated the case, called membranous croup. The case did not come to my notice until investigating the cause of the reported case, and I found that Mrs. Long nursed the child with croup. The remains were sent (after a public funeral) to Burr Oak for burial.

#### MEASURES TAKEN TO RESTRICT DIPHTHERIA, AND THEIR RESULTS.

The following are a few extracts from the reports of health officers relative to measures taken to restrict diphtheria:

Dr. J. H. Royce, health officer of Lake township, Berrien county, writes:

"Placarded premises. No person excepting the family was allowed on premises. I went near no person upon leaving house until my clothes were renovated. Took no other patients during the time. Buried child immediately after death. All public gatherings were stopped in township for two weeks succeeding outbreak of disease. Board of health, as well as citizens in general, sanctioned the burning of household goods, and freely paid for same according to my invoice."

Only this one case occurred in this outbreak.

Dr. Geo. W. Orr, health officer of Schoolcraft township, Houghton county, writes, in answer to the question, "Were the patients kept isolated from other people except nurse and physician?"

"Yes. In one family, with nine children, one had diphtheria and died; none of the remaining eight have yet come down with the disease. I immediately put guards on by day and night, and have thoroughly fumigated and disinfected two houses."

He had but three cases in a family of nine children, and no cases outside this one family.

Dr. T. M. Winters, health officer of the village of Dansville, Ingham county, writes:

"I first allowed no one from outside to go into the house but the physician, and no one else was permitted to come out on the streets. I confined the patients to the upper story, and allowed no one else up there but the physician and nurses. The disease was confined entirely to one family, and only two cases in that family of six."

\* Ziemssen, p. 575 (a); and Quain, p. 375.

Dr. Adolph Hochstein, health officer of the city of Kalamazoo, writes:

"The patients have been kept, during their illness and convalescence, in one room. Nobody but physician and nurse came in contact with them."

He fumigated and disinfected the premises. The above refers to two cases in two families, with children in each family; two separate outbreaks.

Dr. J. A. Morey, health officer, township of Caladonia, Kent county, writes concerning an outbreak in his jurisdiction which was limited to one case:

"As soon as I saw the case I caused the patient to be conveyed to an upper room, and at once fumigated the apartment which she first occupied. During most of her illness was in the chamber room."

Dr. Edmund Conley, health officer, Watertown township, Tuscola county, writes that the patient was kept away from the rest of the family, and none of the family allowed to go at large until all were thoroughly disinfected. But one case occurred in this outbreak.

#### PRACTICAL RESULTS IN RESTRICTING DIPHTHERIA.

In the following table and diagram, in the compiling of which 311 outbreaks\* are considered, some of the results of the efforts to restrict diphtheria are shown.

In studying this table it should be borne in mind that the outbreaks considered in the third, fourth, fifth and sixth double column are *not* included in the seventh and eighth column, and that the third, fourth and seventh *are* included in the ninth column. This ninth column is compiled on the same principle as the fourth column in the tables for diphtheria found on pages 212 and 235 of the Reports of this Office for the years 1886 and 1887 respectively. The five double columns, from the third to the seventh inclusive, in the following table have been worked out for the first time in the present compilation. The object of this is to determine, if possible, the efficacy of either isolation or of disinfection when employed alone for the restriction of diphtheria. However, the reported outbreaks of these classes during the year 1888 are so few that no conclusions can be drawn from them, but it is believed that by continuing this classification for a series of years data will be accumulated which may yield important information as to the relative value of isolation and disinfection.

In the 311 outbreaks in the following table there were 1,529 cases and 324 deaths, an average of 4.92 cases and 1.04 deaths per outbreak. In the 199 outbreaks in which isolation or disinfection or both were not mentioned or the statements were doubtful, there were 810 cases and 189 deaths, an average of 4.07 cases and .95 deaths per outbreak. In the 20 outbreaks in which isolation was neglected and disinfection was enforced or doubtful there were 141 cases and 36 deaths, an average of 7.05 cases and 1.8 deaths per outbreak. In the six outbreaks in which disinfection was neglected and isolation was enforced or doubtful there were only 6 cases and no deaths. In the 12 outbreaks in which isolation was enforced and disinfection neglected or doubtful

\* Whenever a break of sixty days or more has occurred in the progress of diphtheria it has hitherto (in this article) been uniformly regarded as two different outbreaks, but in estimating outbreaks for this table, in those cases in which the second appearance of the disease originated from the first, the intermission was disregarded and it was treated as a single outbreak. Also, comparisons of *years* require that outbreaks be counted as closed at the close of the year; while in comparing *outbreaks* for testing the value of isolation and disinfection it is necessary to take complete outbreaks even where they extend from one year into the next. This explains the apparent discrepancy between the number of outbreaks here given and the number given at the beginning of this article.

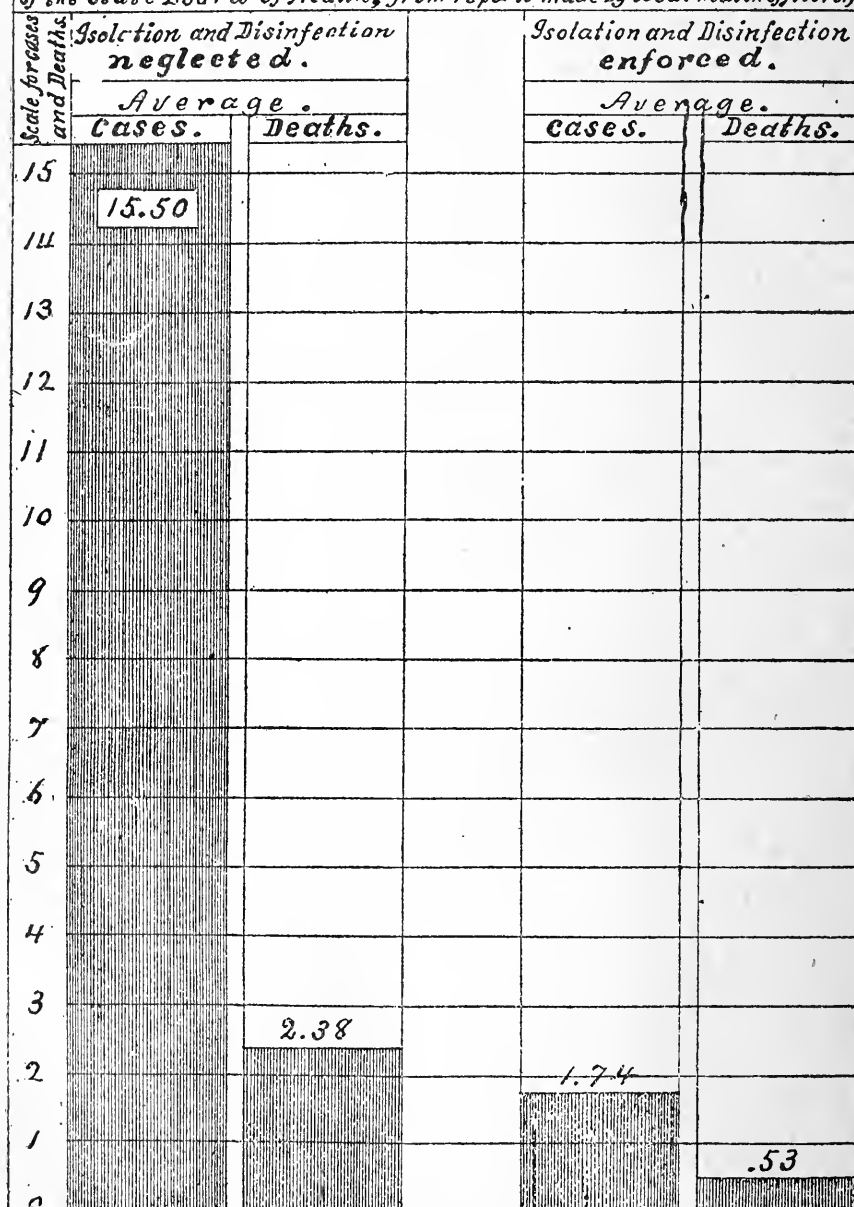
TABLE.—*Diphtheria in Michigan in 1888: Exhibiting the Average Numbers of Cases and Deaths per Outbreak:—(1) in all the 371 outbreaks reported; (2) in the 199 outbreaks in which it is doubtful whether or not Disinfection or Isolation was enforced; (3) in the 20 outbreaks in which Isolation was neglected and Disinfection was enforced or doubtful; (4) in the 6 outbreaks in which Disinfection was neglected and Isolation was enforced or doubtful; (5) in the 12 outbreaks in which Isolation was enforced and Disinfection was neglected or doubtful; (6) in the 15 outbreaks in which Disinfection was enforced and Isolation was neglected or doubtful; (7) in the 34 outbreaks in which both Isolation and Disinfection were neglected; (8) in the 58 outbreaks in which both Isolation and Disinfection were enforced; and (9) in the 60 outbreaks in which Isolation or Disinfection or both were neglected.*

(1) All Outbreaks. (311 Outbreaks. *)	(2) Isolation or Dis- infection or both not mentioned, or statements doubtful. (199 Outbreaks.)		(3) Isolation Neg- lected, Disinfec- tion enforced or doubtful. (20 Outbreaks.)		(4) Disinfection Neg- lected, Isola- tion enforced or doubtful. (6 Outbreaks.)		(5) Isolation enforced, Disinfection neg- lected or doub- tful. (12 Outbreaks.)		(6) Disinfection en- forced, Isola- tion neglected or doubtful. (15 Outbreaks.)		(7) Isolation and Dis- infection both neglected. (34 Outbreaks.)		(8) Isolation and Dis- infection both enforced. (58 Outbreaks.)		(9) Isolation or Dis- infection or both neglected. (60 Outbreaks.)			
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.		
Totals.....	1,529	324	810	189	141	36	6	0	18	1	89	24	527	81	101	31	674	117
Averages.....	4.92	1.04	4.07	.95	7.05	1.80	1.00	0	1.50	.08	5.93	1.60	15.50	2.38	1.74	.53	11.23	1.95

\* These do not include the cases in Detroit and Grand Rapids, because of the difficulty in determining the beginning and ending of an outbreak in these cities, in which the disease is present in some part of the city nearly all of the time. See footnote on page 214.

## ISOLATION AND DISINFECTION RESTRICT DIPHThERIA.

*Diphtheria in Michigan in 1888:—Exhibiting the average numbers of cases and deaths per outbreak:—in those outbreaks in which Isolation and Disinfection were both Neglected; and in those outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)*



ful there were 18 cases and one death, an average of 1.5 cases and .08 deaths per outbreak. In the 15 outbreaks in which disinfection was enforced and isolation neglected or doubtful there were 89 cases and 24 deaths, an average of 5.93 cases and 1.6 deaths per outbreak. In the 34 outbreaks in which isolation and disinfection were both neglected we have 527 cases and 81 deaths, an average of 15.5 cases and 2.38 deaths per outbreak. In the 58 outbreaks in which isolation and disinfection were both enforced there were 101 cases and 31 deaths, an average of 1.74 cases and .53 deaths per outbreak.

In the ninth column (formed by combining the third, fourth and seventh columns to compare with the fourth column in like tables for diphtheria found in the Reports from this Office for the years 1886-7) there are 60 outbreaks with 674 cases and 117 deaths, an average of 11.23 cases and 1.95 deaths per outbreak.

Although by this evidence for a single year it may be seen by studying the third, fourth, fifth and sixth columns in the above table that isolation, as compared with disinfection, where only one or the other is enforced, seemed to produce the better result in limiting the number of cases in an outbreak, it should not be concluded that because isolation seems to be the most potent factor in limiting the number of *cases* in an outbreak it will have the same effect in limiting the *number of outbreaks*. If disinfection is neglected, the reverse may be realized in the same or in some future year, for the reason that the diphtheria germ seems to retain its vitality for months and even years, and a new outbreak may occur whenever a susceptible person comes in contact with the material which was not disinfected. If we would limit this terrible disease it is necessary, therefore, that disinfection as well as isolation be rigidly enforced.

By the table it seems to be indicated that if no restrictive measures had been taken in the 311 outbreaks, and the average had remained 15.50 cases and 2.38 deaths per outbreak, as in the 34 outbreaks in which no restriction was practiced, there would have been 4,821 cases and 740 deaths. Deducting from these the cases, 1,529, and the deaths, 224, which actually occurred, there is indicated a saving of 3,292 cases and 416 lives from diphtheria during the year 1888 by isolation and disinfection. Had the measures of restriction been enforced in each of the 311 outbreaks, as it was in each of the 58 outbreaks in which they *were* enforced, the number of cases would have been only 541, and the number of deaths 165. Deducting these from the number of cases (1,529) and deaths (324) that *did* occur in the 311 outbreaks, there is indicated as having occurred 988 cases and 159 deaths from diphtheria in 1888, which could have been prevented by thorough isolation and disinfection in all outbreaks.

To the health officers and local boards of health who failed to conscientiously and vigorously enforce these restrictive measures, these 988 cases and 159 deaths, which might have been saved, must awaken keen regret, and must plead eloquently for increased care and diligence in the future; while to those who enforced isolation and disinfection the 3,292 cases and 416 lives

## RESTRICTION OF DIPHTHERIA IN MICHIGAN.

TABLE.—Exhibiting for the three Years, and for each of the three Years, 1886-8, the Number of reported Outbreaks, Cases and Deaths; also, for this three-year Period, the average Number of Cases and Deaths per Outbreak in all Outbreaks; in those Outbreaks in which Isolation or Disinfection was Doubtful; in which Isolation or Disinfection, or both, were Neglected; in which both Isolation and Disinfection were Neglected; in which both Isolation and Disinfection were Enforced; and also the Numbers of Cases and Deaths Indicated to have been prevented by Isolation and Disinfection.

Years.	Indicated Saving of Cases and Lives by Isolation and Disinfection.*			All Outbreaks.†			Isolation or Disinfection, or both, not Mentioned, or Statements Doubtful.			Isolation or Disinfection, or both, Neglected.			Isolation and Disinfection both Enforced.		
	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.
1886.....	4,374	833	461	3,085	656	243	1,103	250	102	1,650	329	†	116	332	77
1887.....	2,371	518	398	2,321	561	202	732	190	118	1,391	320	60	78	193	51
1888.....	\$ 3,292	\$ 416	311	1,529	324	199	810	189	60	674	117	34	58	101	31
Totals.....	10,037	1,767	1,170	6,935	1,541	644	2,645	629	280	3,715	766	94	252	631	159
Averages.....	3,346	589													
Av. cases and deaths per outbreak.....				5.93	1.32		4.11	0.98		13.27	2.74			2.50	0.63
										14.35	2.94				

† Outbreaks in Detroit and Grand Rapids not included.

‡ This column not compiled for the year 1886.

|| Average for the two years 1887-8.

\* For the years 1886 and 1887, the numbers of cases and deaths in this double column are found by multiplying "all outbreaks" for the year by the average number of cases or deaths per outbreak in the "Isolation or Disinfection or both Neglected" column, for that year, and deducting from the result thus obtained, the cases or deaths, as the case may be, which *did* occur in that year.

§ For the year 1888, these results are obtained in the same manner as stated in the (\*) footnote above, except that "All Outbreaks" for that year are multiplied by the average number of cases or deaths per outbreak in those outbreaks in which "Isolation and Disinfection both were Neglected." These averages are: cases, 15.50; deaths, 2.38; as shown in column No. 7, in Table on page 211, of this Report.



which were thus saved are great cause for congratulation. This view is strengthened by reference to the foregoing table, from which it may be seen that during the three years, 1886-8, there is indicated the prevention of 10,037 cases and 1,767 deaths from diphtheria alone by isolation and disinfection.\*

#### SOME MONEY LOSSES WHICH SHOULD HAVE BEEN PREVENTED.

During the ten years 1877-86 there were reported to the Secretary of State as having occurred in the State of Michigan 12,217 deaths from diphtheria. The average per cent which the deaths reported were of all cases reported to the State Board of Health for the seven years, 1882-8 was 23.84, and this varies but little from year to year, as noted on page 203. Taking it for granted that the three years prior to 1882 would not change this average, the 12,217 deaths represent 51,246 cases of sickness from diphtheria as having occurred in the State during the ten years. Estimating the average cost to parents, and others at the low figure of twenty dollars for each case (saying nothing about the value of lives lost), this number of cases cost the people the sum of \$1,024,920.

Taking the average number of cases per outbreak, in *all* outbreaks for the three years, 1886-8, as shown in the table on page 214, which is 5.93, and dividing the number of cases as given above, by this average, the result shows that this number of cases represents 8,642 outbreaks.† The average number of cases per outbreak, for the three years (shown in the column under the head of isolation and disinfection enforced), is 2.50. Multiplying the number of outbreaks for the ten years, as noted above, by this average, we find that had isolation and disinfection been enforced we would have had only 21,605 cases, with a money loss, at twenty dollars per case, of \$432,100. Deducting this from the \$1,024,920, there is indicated a loss, because of diphtheria, of \$592,820 during the ten years in those localities where measures for restriction were neglected.

#### HOW DIPHTHERIA IS SPREAD,—TRANSGRESSIONS OF PUBLIC HEALTH LAWS.

Frequently reports reach this office of persons infected with the contagium of diphtheria being permitted to go, in violation of the health laws of the State, from one family to another, to go upon the public streets, or to public or social gatherings, to go from one jurisdiction to another, and to travel upon the railroads, etc. To these transgressions of the laws, we can ascribe a large per cent of outbreaks of this disease in our State. In a great many instances the health officer fails to thoroughly isolate the patient or disinfect the rooms and clothing, thereby allowing the germs of the disease to remain, to cause another outbreak at some future time; others allow public funerals, or the dead body to be conveyed from one point to another, scattering the contagium through the land.

\* Of course the numbers of cases and deaths here indicated as prevented are too small; because, if the outbreaks had been entirely unrestricted, many, perhaps all, of them would have spread into other jurisdictions, and from these into still others, thus causing many more outbreaks. (Whenever a disease spreads across the line into another jurisdiction it must then be considered as a new "outbreak.") and these, being unrestricted, would have caused many more cases and deaths; so that there was probably prevented many more cases and many more lives were saved by isolation and disinfection than the numbers here given.

† It should be borne in mind that in this number of outbreaks are included those in which isolation and disinfection were enforced. Had nothing been done to restrict the disease, the amount stated as the money loss to the people would be greatly increased.

The following are a few extracts from letters, received at this office, bearing on this subject:

Dr. T. M. Winters, health officer, Dansville village, Ingham county :

"Mrs. Aseltine, a widow aged 25, and mother of two children, a girl aged six, and a boy aged eight, residents of this village, were visiting in Wisconsin, returned to this place Nov. 10, 1888, staid two days and again departed, the girl going to Hastings, Mich., to a relative there, and the mother and boy to Vermontville, Mich., all in good health; arrived at their destined places Nov. 13, 1888. On Nov. 15, the two children were taken sick with diphtheria, the one at Hastings, the other at Vermontville; Nov. 24 the girl died at Hastings. On hearing of the death, suspecting that they would bring the corpse here for burial, I telephoned to Dr. Fuller, health officer of Hastings, to find out whether proper precautions had been taken or not. He replied that he knew nothing about it further than that he heard she died from diphtheria. \* \* \* \* We went to bed, awaking in the morning to find the pest among us, for the corpse had arrived at midnight. \* \* I found the infected at the residence of her father, so I forbade any of the family or house-mates coming out. I also put up a notice, by placing a placard on the door, forbidding any outsider going in. The next afternoon, Nov. 26, Mrs. A. sickened with the same disease, where she now lies with complete isolation."

By complete isolation and thorough disinfection the health officer was enabled to limit this outbreak to two cases.

Dr. W. H. Fuller, health officer of Akron township, Tuscola county, reports as follows concerning an outbreak in which there were 42 cases and two deaths:—

"First cases appeared in the school in Sept., 1888, and were not considered by parents anything but ordinary sore throat, no physician being called until almost the whole school was infected. No apparent cause for outbreak."

Dr. Edmund Conley, of Watertown, Tuscola county, writes as follows of a case that he had under treatment:—

"Please permit me to say a few words concerning a case I treated in the township of Rich, Lapeer county, the particulars of which I am suspicious you have not in your possession. It is as follows:—A young man, named S., who lived in Rich, Lapeer county, has been engaged in the lumber woods at Roscommon, Mich., all summer until Sept. 18, when he took the train to Otter Lake, Lapeer county, and rode home about ten miles in a buggy. I was immediately summoned to see him, found him in a dying condition with the worst form of diphtheria I ever saw,—nasal, pharyngeal and laryngeal varieties combined. He died in about two hours after his arrival home; he was sick three or four days at Roscommon and was treated by a physician there, who, taking the young man's statement and others with him, did not make that diagnosis. I don't know who the physician is, but I don't believe he failed to make the diagnosis; but on the other hand believe the young man, learning what he had, ran away from there in his anxiety to get home. He was seen at Otter Lake by a physician who diagnosed diphtheria, and permitted him to be sent home.

"He must have been in a dying condition when he left Roscommon, and it must have been exceedingly difficult to occupy the same car with him, the stench was so intense and offensive. The parties with him, and himself, called it blood poisoning, thus being allowed to ride on the cars. There was certainly blood poisoning, but of a diphtheritic character."

Dr. W. M. Cake, health officer of Chippewa township, Mecosta county, reports that his orders were disobeyed in regard to the burial of a child which had died of diphtheria. He says that the body was "taken to Big Rapids, 14 miles distant, with consent of the health officer at the Rapids, and in violation [of the orders] of our own."

Of the outbreak in Livonia township, Wayne county, L. G. Pierson, health officer, says:—

"I do not believe there was any local cause for the epidemic, and am quite of the opinion that the disease had been spread around by inconsiderate visiting, and calling on the sick with the disease."

There were 28 cases and 13 deaths reported as having occurred in this outbreak. From the number of deaths reported it is fair to estimate the cases at twice the number reported.

Dr. Henry F. Lyster, member of the State Board of Health, appointed to investigate this outbreak of diphtheria at Livonia, has made a report to the health officer of Livonia, in which he states that the type of disease is not worse than it is in Detroit, that the cases are more severe now on account of the cold weather and the crowding of cases in unventilated rooms. He does not think that the outbreak is caused by the water-supply, as some supposed, or that it arises from any local source, but that it has been communicated from person to person. He strongly urges the health officer to discourage all public gatherings, to isolate all patients, and disinfect all premises where the disease occurs, according to the direction of the State Board of Health, as given in the document on the prevention and restriction of diphtheria.

An outbreak occurred in Unionville, Tuscola county, which the health officer failed to report, though he was repeatedly requested to do so. From the imperfect reports received from the clerk of the village there appear to have been 29 cases and 11 deaths; but it is probable that complete reports, such as the health officer is required by law to make, would show many more cases and deaths in this outbreak. As may be seen by the following abstract from a statement made in this office, Dec. 28, 1888, by an intelligent public officer in Tuscola county, no effort was made to restrict the disease until it was wide-spread in the community. He says:—

"The first indication that we had of the presence of the disease, was the noticing, by a teacher in the school of the Heauesenplug boy spitting on the floor; he was sent home sick, and the next day it was pronounced diphtheria. The next case was in the Campbell family, and one case in the Dufort family. In the Heauesenplug family, two cases out of five were fatal. The first case was taken the first week of October; the school opened the first week of September. Dr. Wood treated the first case. I think he reported it to the health officer, but I do not know positively. I believe that there are now four cases in the Standart family and two in the Wideman family, I think there are ten or eleven cases that are not out of danger.

"It is generally believed, in the village, that the disease is not contagious,—some of the physicians said it was not contagious without a child was very near the patient for a considerable time. It is only during the last two weeks that public notice of the disease has been given. The Wideman boy went into a house where the disease was present, or had been a few days before, immediately after skating, declaring that diphtheria could not kill him; he was taken down shortly after. He was attending school when taken, about Dec. 10, 1888. The case in the family of E. O. Ainsworth was taken shortly after. The station agent boards with Wideman,—he afterwards had diphtheria. Possibly it was not diphtheria; he roomed with a physician who said it was not. About the middle of October it broke out in the Hill family; the Doctor said it was quinsy, and the children came to school; a messenger came to the school and took them away—their father had come down and was very sick with the diphtheria. In the Dufort family, in which there were six cases, four fatal, the relatives were allowed to come and go as they pleased; one of them said he had held one of the dying children in his arms. The attending physician said that they had been disinfected with corrosive sublimate."

Dr. Edmund Conley, of Watertown township, Tuscola county, writes of an outbreak of diphtheria that began July 5, 1888, as follows:—

"The parties visiting the family who were sick had been there about a week before diphtheria made its appearance. Their visitors had not fully recovered from what was called by their family physician of Rogers, Canada, common sore throat. The period of incubation in this case is therefore about six days. The patient has recovered, and there has been no further trouble, and so far as I can learn there has been no cases from those exposed by the parties who came from Canada to Mayville, Tuscola county, *via* Port Huron on the narrow gauge R. R., and not *via* Detroit as I first supposed and wrote accordingly."

Of another outbreak in September in the same township Dr. Conley traces the source of contagion to these same parties as follows:—

"Your inquiry concerning outbreak of diphtheria at hand. You ask if I can trace any connection between this outbreak and that for which final report was sent under date of July 24, 1888. I will say that I think I can. The case of July 24 is about four miles from this case now on hand. Those parties who carried the contagion of July 24, report having staid with their friends whom they infected until a few weeks ago when the husband went into the employ of D. Goucher, step father of our present patient, as engineer on threshing machine engine. Finally his wife came and staid with Mrs. Goucher about ten days. The patient lives with a neighbor across the road and about 20 rods east, where everything is scrupulously hygienic, as it is also at Mr. Goucher's. The patient was back and forth a great deal of the time. \* \* \* Although the case of July 24 was in every way disinfected according to the most approved method, and parties claim to have followed my directions to the letter, I can't help but believe the lady who carried the contagion to the parties of July 24, carried it to our patient."

Concerning the "Diphtheria outbreak in an unfortunate locality" which occurred in the village of Northville, Wayne county (of which a partial report is found on page 234 of the Report of the Secretary of the Michigan State Board of Health for the year ending June 30, 1888), it may be said that the epidemic did not close with the year 1887. The first case occurred on July 26, 1887, in an upper room over a "meat market—a very public and much frequented place." On the 31st of the same month another case occurred in the same building, and on August 2, still another. In the meantime the "meat market" continued to do business, and the result was an epidemic of diphtheria in the village, which, after a run of about one year, with 115 cases and 7 deaths, was brought to a close about July 2, 1888, by the vigorous measures enforced by Dr. J. M. Swift, health officer, as shown by his letter of July 2, 1888, to Dr. Henry B. Baker, Sec. of the State Board of Health, and by the circular of the village board of health, copies of each of which are here given:—

"Dear Doctor—You may be aware that diphtheria was common here for nearly six months; from October last until, being again appointed to the office of Health Officer, (which I reluctantly accepted), I caused a copy of the enclosed circular to be placed in every house in the village, and to be printed in our village paper. The services of the Marshal were called into requisition with severe measures in two or three instances on the start. Within two weeks there was an end of the disease—except two mild cases in families where it originated, doubtless, from some carelessness some time previous in not thoroughly disinfecting.

"It seems to me quite evident that thorough measures may in most cases 'stamp out' the disease. There were, I presume, more than one hundred cases in our village of 2,000 population, and it seemed to be practically a constant menace to the town. I don't present you with the circular as being a very scientific paper, but the people could understand it, and became aware that there was an earnest power behind it, whether an intelligent one or not. How quickly the disease disappeared!"

The following is a copy of the circular referred to in Dr. Swift's letter:—

#### "THE BOARD OF HEALTH

Of Northville feels it to be its duty to call the attention of all persons within its jurisdiction to the following suggestions and *Rules ordained by the Board* May 1st, 1888, to the end that diphtheria, which has so long menaced the health, well-being and lives of the people may be, if possible, eradicated. To accomplish this end a cordial and painstaking coöperation of every householder and individual is essential. Therefore, the Board expects and most earnestly invites such coöperation.

The germs of contagious and communicable diseases are subtle, and unless the most assiduous care and precaution are observed, there is danger that the dire results to health and life, (and to business interests as well), will be continued in this village. That it may be exterminated—or reduced to the ordinary minimum, we believe to be possible and entirely practicable. Some details necessary to accomplish this are here given.

Avoid the contagium or special cause of disease. Do not take the breath of one sick. Unless you

are needed to care for the sick, do not go near the sick person nor in the house or upon the immediate premises where one is sick, nor after recovery, until after thorough and complete disinfection of the same. Do not allow your lips to touch any food, cup, spoon or anything else that the sick person has touched or that has been in the sick room. Do not wipe your face or hands with any cloth that has been near the sick person. Do not wear any clothing the sick person has worn, during, just before, or just after his sickness, or which has been in the room, or an adjoining room, when there has been a case sick, until properly disinfected and washed.

*Isolate the sick?* Separate those sick with any disease dangerous to the public health, even if they are but mildly sick, from all persons except necessary attendants. Do not go from the sick room to the street or to other persons, until after change of clothing and thorough washing of hands, face, hair and beard, and preferably, in some suitable disinfecting fluid. Always wash the hands thoroughly after handling the sick or anything that has been exposed to the contagion. Destroy the contagium by thoroughly disinfecting whatever is removed from the sick person or from the sick room. All discharges from the patient should be received in vessels containing a strong solution of copperas, and then buried remote from any well or source of water supply, or upon cloths to be immediately burned, or disinfected and buried. All intercourse with the public or with persons other than attendants is to be wholly interdicted.

Where it is possible, the room in which one sick with diphtheria is placed should previously be cleared of all needless carpets, drapery, clothing and other things likely to harbor the poison of the disease. Whatever articles such as towels, bed-linen, etc., are to be preserved, should at once, before removal from the room, be placed in a pail or tub of boiling hot solution made of sulphate of zinc, four ounces; common salt, two ounces; water one gallon; and remain in it for one hour. All persons recovering from diphtheria should be considered dangerous until perfect health and the healing of any sores of lips or nose has become complete. Nor should a person from the premises in which is or has been a case of diphtheria attend any school, Sunday-school, church or public assembly, or be permitted to do so, until after disinfection of such premises and of the clothing that may have been exposed to the contagion of the disease.

No public funeral, or attendance at a burial by unnecessary persons should be permitted. After recovery or death of the sick one, there must be special care and thorough work in disinfecting the entire house, and every article in it. That is a matter which is of the *utmost importance*. The germs of the disease are almost immortal, unless killed by some germicide. The only handy method is that of burning sulphur or brimstone. Carpets must be taken from the floor and lifted upon chairs or by other devices, and all articles of clothing, drapery, bedding, etc., hung so that the fumes of the sulphur may penetrate every thread, and aperture of the walls, closets and other parts of the building from cellar to garret. The quantity of sulphur to be burned should correspond to the amount of space to be fumigated—at least two lbs. for every 1,000 cubic feet of air space, the rooms closed tightly and remain closed for many hours, then opened and fully ventilated for a sufficient time. Until all this has been efficiently accomplished, there is no safety against the contagium. Infected clothing and bedding have been known to communicate diphtheria months after their infection. No sufficient disinfection of the residence can be had without vacating it entirely.

The Board calls special attention to the importance of keeping children from the streets and public places, so long as diphtheria is anywhere about the town or vicinity. It is believed that the spreading of the disease has resulted more generally from contact with indiscreet persons upon the street than from any other source.—By order of the board of health, J. M. SWIFT, Health Officer."

#### HOW LONG WILL THE DIPHTHERIA GERM REMAIN ACTIVE.

*Dr. George M. Bell, health officer, Benton Harbor, writes:*—"Child living in the village went visiting to an adjoining township and remained in a house one week, where diphtheria prevailed two years ago."

*Dr. J. H. Royce, health officer, Lake township, Berrien county:*—"Disease contracted by playing with a child wrapped in a shawl which lay in a crib of a child that died of diphtheria, in Buchanan, Berrien Co., about two months previous to this exposure."

*Dr. C. H. Rodi, health officer of the village of Red Jacket, Houghton county:*—"A case occurred two years previous in the same house."

*T. A. Schumann, health officer, Taylor township, Wayne county:*—"It is the opinion of the physician and also mine, that the diphtheria was in the house, they having had the disease about ten months ago."

## PERIOD OF INCUBATION, IN DIPHTHERIA.

TABLE.—*Exhibiting the reported Period of Incubation, stated in days, in thirty cases of Diphtheria. Compiled from reports of health officers in Michigan, for the year 1888.*

Incubation period—Days.....	2	4	5	6	7	8	9	10	14	18	21	30
Cases in each period.....	1	*3	2	1	†7	‡6	3	1	2	2	1	1

\* In two of these cases it was reported as "about four days."

† In two of these cases it was reported as "about seven days."

‡ In one of these cases it was reported as "about eight days."

The average period of incubation of diphtheria in the thirty cases is 9.3 days.

TABLE.—*Exhibiting, relative to Diphtheria in Fourteen Instances in Michigan in 1888, the Reported Period of Incubation, within certain Limits, stated in Days; also the Means, the Average of which may Represent the Average Period of Incubation.*

Days. (In three Instances.)	Means.	Days. (In three Instances.)	Means.	Days. (In three Instances.)	Means.	Days. (In three Instances.)	Means.	Days. (In two Instances.)	Means.
1 to 9 .....	5.0	4 to 10 ....	7.0	5 to 19 ....	12.0	6 to 12 ....	9.0	8 to 10 ....	9.0
1 to 14 .....	7.5	5 to 7 .....	6.0	5 to 25 ....	15.0	7 to 14 ....	10.5	9 to 12 ....	10.5
4 to 5 .....	4.5	5 to 8 .....	6.5	6 to 10 ....	8.0	7 to 21 ....	14.0		

The average of all the means, for the 14 instances, is 8.9 days.

TABLE.—*Exhibiting the reported Period of Incubation stated in days in Fifty-eight cases of Diphtheria. Compiled from reports of health officers in Michigan, for the year 1888.*

Incubation Period—Days. ....	1	2	4	5	6	7	8	9	10	12	14	18	19	21	25	30
§ Cases in each Period.....	2	1	*5	7	3	†10	‡8	5	4	2	4	2	1	2	1	1

\* In two of these cases it was reported as "about four days."

† In two of these cases it was reported as "about seven days."

‡ In one of these cases it was reported as "about eight days."

§ The average length of the period of incubation of diphtheria in the fifty-eight cases is 9.1 days.

§ These cases are the extremes in the table on this page (assuming that a case occurred at each extreme) together with the 30 cases represented in the table on this page.

## REMOVAL OF BODIES DEAD FROM DIPHTHERIA.

S. O. Flint, of Homer, writes under date of March 1, 1888.

"Two years ago two persons died with malignant diphtheria. Through mistake they were buried on the wrong lot. Would it be safe to disinter and remove the bodies to another lot."

March 3, 1888, the Secretary of the State Board of Health replied as follows:—

"Dear Sir—In reply to your letter relative to the removal of bodies, dead from malignant diphtheria, I would say that I consider it a very dangerous experiment, especially in the winter time, as the danger of spreading the disease is much greater in the cold weather. In case the bodies are

removed, no person under twenty years of age should be allowed near the grave at the time, and before the coffin is removed from the grave, at least three pounds of sulphur should be burned in the grave covered by boards to insure thorough disinfection of the outside of the coffin and box at least."

The following letter was received on March 12, 1888, from S. J. Smith, health officer, Fair Grove township, Tuscola county:—

"I desire instructions relative to the removal of persons dead of diphtheria. In October last three in one family died of diphtheria, and were buried in common coffins. It is now desired by the parents of the dead to remove the bodies to the cemetery, and application is made to me for their removal. Can the bodies be removed as they are, lawfully? If not, what preparation or precautions are necessary to the removal? To my mind the bodies should remain where they are. There will be objections to the removal and I wish instructions, that no step may be taken illegally, or that may unnecessarily expose the living."

The following reply was sent, March 12, by the Secretary of the State Board of Health:—

"In reply to your letter of March 9, it seems to me that the removal of the bodies of persons dead of diphtheria, at this time, would be extremely dangerous. Of course the body dead from diphtheria may be more dangerous to health by possible contamination of the water supply where it now is than if moved to the cemetery; but your letter states nothing of this kind, and from the face of your letter I think it would be taking great risk to remove the body. If any removal is made it should not be permitted during cold weather, because the danger from diphtheria is much greater in cold than in warm weather."

At the regular meeting of the Michigan State Board of Health held in Lansing, October 23, 1888, the following was adopted:—

### *Precautions in Exhuming Bodies Dead from Dangerous Communicable Diseases.*

No board of health or health officer in Michigan should permit the disinterment and removal of the body of a person dead from diphtheria, small-pox or scarlet fever, at any other season of the year than spring or summer (preferably in June or July), because there is much the most danger of the spread of these diseases in the cold season.

When a body dead from diphtheria, or any other dangerous communicable disease, is proposed to be exhumed or reinterred, notice should be given to the Secretary of the State Board of Health, and such removal should not take place except by permission of the health officer of the locality to which the body is to be removed, and then under direction of the local health officer, and with the following precautions:—When the grave-digger has dug down to and uncovered the coffin, and before the removal of the coffin, a small opening should be made in each end of the coffin (unless it is a metallic case), and two pounds of sulphur should be burned in the grave, so covered as to retain the fumes. (The box which is to contain the coffin may be inverted over the grave and thus fumigated.) Then the coffin should be sprinkled and drenched with a solution of corrosive sublimate containing one part of the mercuric chloride to five hundred parts of water. After the coffin is removed, it should be placed in a box which can afterwards be hermetically sealed, the coffin should be surrounded with sawdust saturated with a strong solution of corrosive sublimate—one part to five hundred—and after the outer case is hermetically closed, the case should be disinfected by exposure to the fumes of burning sulphur, or by thorough drenching with solution of corrosive sublimate, of the strength mentioned above.

No child should be permitted to be near the place of disinterment or reinterment; and no grave-digger or other person who is present on either of these occasions should go near a child without first having a change of clothing and a thorough bath, and then not during the existence of any sore throat which may be contracted on such an occasion.

Prof. Delos Fall, member of the State Board of Health, reported his investigation of an outbreak of a disease resembling diphtheria, in the township of Concord, Jackson county, as follows:—

#### OUTBREAK OF A FATAL DISEASE WHICH MAY HAVE BEEN DIPHTHERIA.

"In Concord township, on the Concord road, two and one-half miles east of the city of Albion, stands a deserted farmhouse. Two months prior to the time of visit and examination of the premises, of which the following is an account, this house was the home of Enoch Darling, aged 70 years, and family, consisting of his wife, aged 68 years, his daughter, Mrs. Lillie Moyer, aged 40 years, a son, John Darling, aged 26 years, Freddie, a seven year old son of Mrs. Moyer, and a niece, Nina Ashley, aged 19 years, who was living with the family and teaching the district school.

At the beginning of the month of November, all the inmates of this home were in their usual health. Within 37 days, six out of the eight were attacked, with symptoms of a serious and severe nature, three cases of which proved fatal: Mrs. Darling, who died November 27, Miss Ashley, who died Dec. 18, and Mr. Darling, who died Dec. 24.

The attending physician, E. L. Parimeter, M. D., has kindly made a report of the symptoms and treatment.\*

Case No. 1. Mrs. Moyer, aged about 40: First saw patient Nov. 11, 1888. Had all the symptoms of the ordinary sore throat that was prevailing at the time. Temperature, 103-2, pulse, 120. Nov. 12, patient much better; pulse and temperature normal; throat nearly well. Nov. 13, patient reported by her friends to be feeling well; throat well. Nov. 14, was called again; some fever with a good deal of prostration. Nov. 15, patient better again. From Nov. 16-19, slowly improving. Nov. 20, patient worse: good deal of pain in bowels with persistent nausea, but without much vomiting. Nov. 21, again better until 25, when she was attacked with rheumatic pains in the whole left side of body, especially in region of the heart: temperature, 102-2, pulse irregular with blowing sound over the mitral valves; pains and irregularity of the heart were very persistent until Nov. 30th, when she gradually began to improve and has recovered entirely, except slight pains in some of the joints at times.

Case No. 2. Freddie Moyer, aged 7 years, son of Mrs. Moyer: Taken sick Nov. 14 with symptoms of ordinary sore throat; temperature, 103-2, pulse 140. 15th, pulse and temperature normal, throat much better; from 16-18 he was apparently well. 19th, good deal of pain in bowels with nausea; slight fever. 20th, condition unchanged. 21st, better; gradually improved and recovered.

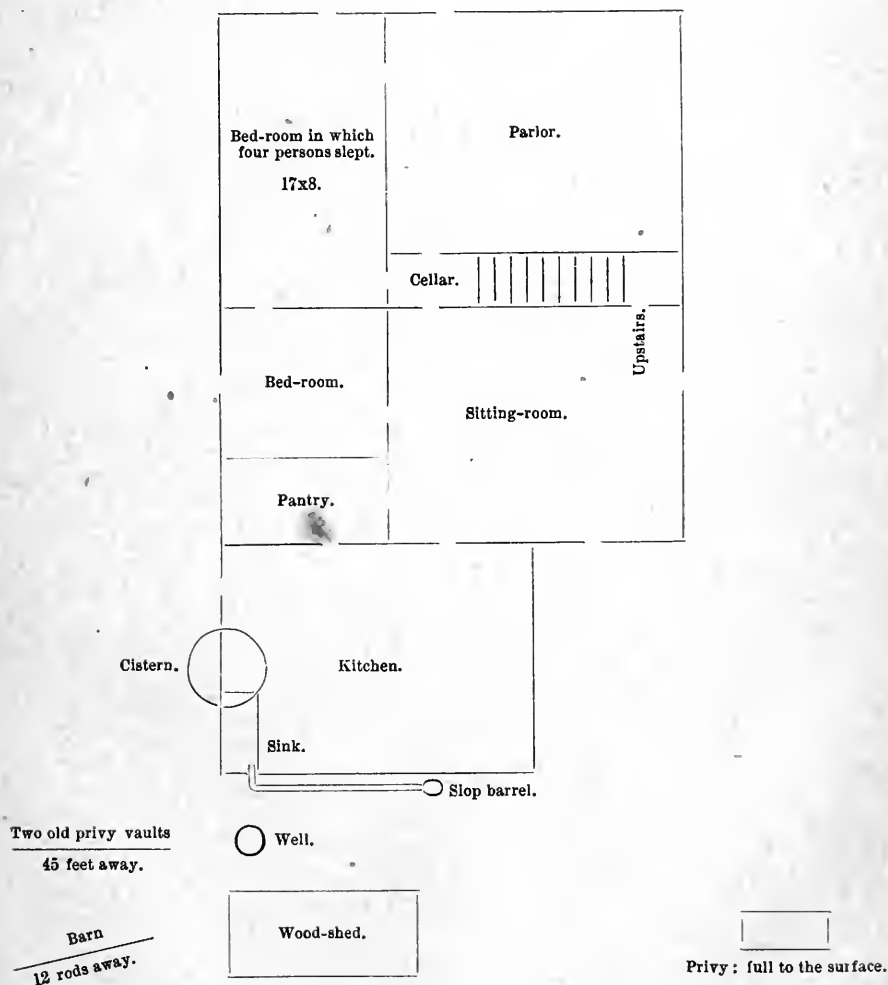
Case No. 3. Mrs. Enoch Darling, aged about 68, mother of Mrs. Moyer: Taken sick with sore throat Nov. 22nd. She treated her throat with a gargle of chlorate potass and sulpho-carbolate soda that I had left for the others. 23rd, about the same. 24th, better and around the house. 25th, worse; I saw her about noon of that day; temperature, 103-2, pulse 135 and very weak; feet and hands cool; head very hot; intense headache. In the evening, temperature, 102, pulse 135; great deal of pain in bowels with persistent vomiting. 26th, pulse, 145; temperature, 102; still vomiting, with severe pain in bowels. 27th, temperature, 100; pulse scarcely perceptible; extremities cold. She gradually sank and died at 5 P. M.

Case No. 4. Nina Ashley, school teacher, aged 19: Taken sick December 11 with sore throat, and treated herself for two days. I was called the 13th. Found patient with throat very much inflamed and with large white patches over the tonsils; pulse 145; temperature 103-2. Dec. 14th, patient up and dressed when I called, and expressed herself as feeling a great deal better; temperature normal; pulse 115; patches all gone from the throat except one the size of wheat kernel. Was called again the 17th; learned that she had felt well the 15th, until the evening when she had a slight chill, followed by some fever, but it was gone again in the morning, and she was up and dressed and took her meals with the family during the day. In the evening of that day, the 16th, she had a hard chill, followed by a high fever. When I saw her at noon on the 17th, I found her temperature 104-2; pulse 154; there was nausea and vomiting with very loose stools, her mother having given her a teaspoonful of powdered Rhubarb the evening before. Saw her again in the evening; temperature, 104-2; pulse 160; slightly delirious. Dec. 18th, temperature 104; pulse scarcely perceptible. Sank and died 10 P. M.

\* Medical treatment is uniformly omitted from publications by the State Board of Health.—H. B. B., Sec.



Case No. 5. Enoch Darling, aged about 70: Taken sick with sore throat Dec. 16th. I saw him the 17th; temperature, 103-2; pulse 90. 18th, temperature normal; pulse 56; throat apparently well except a slight enlargement of glands of neck. 19th, pulse 60; temperature normal; good appetite; went out doors and said he felt pretty well only a little weak. That night he had a slight fever, but on the morning of the 20th, his temperature was normal and pulse 50. In the evening of that day, pulse 60, and temperature, 103-2; good deal of pain in bowels, with nausea and vomiting; tympanitis 21st, condition about the same as the evening before, except he had a very sharp pain in the left side in region of sigmoid flexure; seemed very much like the rheumatic pains that Mrs. Moyer had in the same place. 22nd, about the same; temperature, from 103-2 to 104-2; pulse about 80. 23rd, temperature, 102; pulse, morning, 90, evening, 120; not as much pain in bowels or side, but complains of a great deal of soreness of the muscles, especially those of the arms; delirious in the evening. 24th, bowels moved freely and naturally at noon; tympanitis entirely gone; temperature, 102; pulse scarcely perceptible. Sank gradually and died at 5 P. M.



Case No. 6. Carrie Berry, domestic, aged about 20: Had been working there about two weeks. Was taken sick with sore throat Dec. 18th. Went to her home in Concord. I have not been able to get a report of her case, but have understood that she was sick in about the same way that the others were, but eventually recovered.

Lizzie Watkins worked at the place for about ten days after Miss Berry left, but was not sick nor has she been since, so far as I can learn.

John Darling, the son, slept in the small bed-room and the window of this room and the windows of the sitting-room were opened when they ventilated the house, which was not very often. He was not sick at all. The school teacher and domestics slept up stairs.

No person save those who have been regular inmates of this house have been victims of this peculiar outbreak. Several persons, friends and near neighbors, have spent a considerable amount of time in the house, giving attendance and care, both to the sick and dead, none of whom have suffered in the slightest particular.

The object of this investigation has been of a two-fold nature, namely:

First, to discover for the remaining members of the family the cause of the outbreak, in order to suggest measures for restriction.

Second, in the interests of general sanitary science.

To this end, a careful sanitary survey of the premises was made, showing the situation of the house and surroundings as follows:—(printed on preceding page).

The house is a low, one and a half story structure, with ceilings so low that the ordinary man can touch them without difficulty. The house is damp from a leaky roof over sitting room, numerous pans placed about under the leaks, as well as the statement of the son John, being testimony that the rain fell upon the sleeping occupants of beds. The cellar is damp and mouldy, the decayed apples, etc., common to cellars of the ordinary farm-house, found here in abundance; the cistern, which by the diagram, is seen to be located directly under the kitchen, is not provided with an overflow pipe and yet has never been known to be full. At present it contains but little water, the surface of which is covered with an iridescent scum; *six feet away is the well*, which no doubt has been the receptacle into which the contents of the leaky cistern has drained. The sink in the kitchen communicates with a barrel on the outside which has been used as a receptacle for washing hands only; the drain pipe is not fitted with any kind of trap.

The sleeping room occupied by Mr. and Mrs. Darling is a long, narrow room, long enough to permit two beds to be placed end to end with a space by their side just wide enough to permit the passage of a person. Ventilation might have been secured in this room by opening a door leading into the parlor or a window at the outside; the door was securely closed by the bed which was placed against it. The above window was open every day until cold weather. The women who slept here would not permit the window to be opened, for fear, as they said, of tramps. In this room slept four persons: Mr. and Mrs. Darling, Mrs. Moyer and her son; Mr. Darling had frequently remarked to the neighbors that he had not slept at all the night before, because, as he said, "Those women will not let the window be opened." He added, "It is not good to sleep without air." Entrance to this room was effected by passing through a second small bed-room occupied by a third person, John Darling, and by another door from a small alcove off from the sitting room. From this alcove also opened the doors that led to the cellar and parlor. The bed in John's room was placed against the door opening into the other bed-room. The walls of his room were papered by a common old-fashioned wall paper, some of which was brought away for examination. No arsenic was found in this.

Suspicion was first attached to the water, and its use, by order of the attending physician, was discontinued; but after this date, the school teacher, Mr. Darling and the hired girl were attacked in exactly the same manner.

The milk was thought to be the cause, but the one member of the family, John Darling, who has not been sick, used more milk than any of the others; on being questioned, however, he said that he usually drank new milk, while the others used that which had stood for some time; moreover, a second hired girl who abstained from the use of milk, was not affected. Two theories presented themselves as to the probable cause of the contamination of the milk. The milk had been kept in the cellar until about two weeks before the first one was taken sick, after that it was kept in the pantry which communicated with the kitchen by a small door 2x3.

First. The milk was contaminated from the bad air of the cellar and cistern, damp walls, &c.

Second. The cows which had been fed on the smutty oat straw, drank the water from the well, and hence, the theory that the milk might have been poisoned as it came from them; the first

seemed the most probable one; by our direction the cows were again fed for a week from the smutty oat straw, milk from all of them mixed and set for 36 hours, under the exact conditions as before. This milk was examined for poison. Neither Doctor Vaughan nor myself found any poison in the milk.

*Chemical analysis of water from the well:*

The preliminary examination showed that the water contained much suspended impurities, gave a slight odor and taste.

The quantitative examination was as follows:

*Quantitative Analysis of the Well Water.*

Total solids.....	871.43	parts per million.
Total hardness.....	123.57	" " "
Temporary hardness.....		
Permanent hardness.....		
Chlorine.....	32.85	" " "
Free Ammonia.....	.015	" " "
Albumenoid ammonia.....	.17	" " "
Nitrates.....		
Nitrites.....		A very slight trace.

The excessive amounts of chlorine, free and albumenoid ammonia, establish the fact of sewage contamination. The causes of this are undoubtedly explained by reference to the diagram showing relative position of privy vaults, cesspool, leaky cistern, etc.

The following recommendations are suggested as preliminary to any further occupancy of the house:

1. A new roof should be put on the house.
2. The well should be driven down into the rock and properly sealed.
3. The old cistern should be filled up and a new one constructed, wholly outside the house.
4. All connection with the cesspool and sink should be cut off.
5. The cellar should be thoroughly cleaned and ventilated.
6. Proper means of ventilation should be secured for all parts of the house.
7. The entire house from cellar to garret should be thoroughly disinfected by the fumes of burning sulphur in accordance with the directions of the State Board of Health for such cases.
8. The privies should be cleansed and kept so.

## SCARLET FEVER IN MICHIGAN—YEAR ENDING DECEMBER 31, 1888.

During the year ending December 31, 1888, there were reported to the office of the Secretary of the Michigan State Board of Health, 381 \* outbreaks of scarlet fever in 315 localities. In these outbreaks there were reported to have occurred 2,989 cases and 200 deaths. The following map exhibits the number of outbreaks, cases and deaths from scarlet fever in each county in Michigan during the year ending Dec. 31, 1888. From this it may be seen that of the 2,989 cases and 200 deaths in the whole State, 2,221 cases and 151 deaths were reported from the 28 counties comprising the four southern tiers of counties of the State. It may also be seen that from 6 of the 84 counties in the State there were reported 1,458 cases and

\* It is sometimes difficult to decide whether cases in a given place constitute one outbreak or more than one. In connection with a table and diagram on following pages the number of outbreaks is stated differently, but a foot-note gives the reason why.



104 deaths,—more than from all the remaining 78 counties. These six counties, in the order of the greatest number of cases, are as follows:— Wayne county, 960 cases and 71 deaths; Kent, 125 cases and 5 deaths; Oakland, 104 cases and 12 deaths; Bay, 89 cases and 11 deaths; Huron, 88 cases and 5 deaths; Calhoun, 83 cases and no deaths.

## SCARLET FEVER IN MICHIGAN IN 1888, COMPARED WITH PREVIOUS YEARS.

TABLE: *Exhibiting the Number of Outbreaks, Cases and Deaths from Scarlet Fever, together with the Average Number of Cases and Deaths per Outbreak, and the per cent of Fatal Cases, reported to the Office of the State Board of Health for each of the Seven years, 1882-88.*

Year.	Reported Outbreaks.	Reported Localities.	Reported Cases.	Av. No. of Cases per Outbreak.	Reported Deaths.	Av. No. of Deaths per Outbreak.	Per cent of Fatal Cases.
1882.....		83	849	-----	133	-----	*16
1883†.....	164	150	1,802	11.	248	1.51	*14
1884‡.....	324	296	2,476	8.	230	.71	9
1885.....	356	337	2,750	8.	187	.53	7
1886.....	386	302	3,046	8.28	275	.71	9
1887.....	353	297	3,400	9.63	314	.89	9
1888.....	381	315	2,989	7.85	200	.52	6.7

\* Probably in some instances only the fatal cases were reported.

† Use of the blank form "M" for weekly reports was begun in May, 1883.

‡ Use of the annual reports of health officers in compiling scarlet fever for the communicable disease article was begun in 1884.

In the following table is shown a comparison of the number of cases of sickness and deaths from scarlet fever in the year 1888 with the same for the year 1887, and the averages for the four years, 1884-7. It will be seen that there were 28 more outbreaks in 1888 than in 1887, yet there were 411 cases and 114 deaths *less* than in 1887. The average number of cases per outbreak is .63 less than the average for the four years, and 1.78 less than for the year 1887.

TABLE: *Exhibiting the number of reported Outbreaks of Scarlet Fever in Michigan during the years 1887 and 1888, with the number of Localities in which it occurred, the Number of Cases and Deaths, the Average Number of Cases and Deaths per Outbreak, per cent of Deaths to Cases, in each year; with the Departure of the same for 1888 from 1887, and from the Average of the same for the four years, 1884-7.*

Year.	Reported Outbreaks.	Reported Localities.	Reported Cases.	Av. No. of Cases per Outbreak.	Reported Deaths.	Av. No. of Deaths per Outbreak.	Per cent of Deaths to Cases.
1887.....	353	297	3,400	9.63	314	.89	9.
Average for four years, 1884-1887.....	355	308	2,918	8.48	252	.71	8.5
1888.....	381	315	2,989	7.85	200	.52	6.7
Departure of 1888, from '87	+28	+18	-411	-1.78	-114	-.37	-2.3
Departure of 1888 from the Av. for four years, 1884-7	+26	+ 7	+71	- .63	-52	-.19	-1.8

## MEASURES TAKEN TO RESTRICT SCARLET FEVER,—RESULTS.

The following extracts are the substance of reports of health officers which show that they quite fully enforced isolation and thorough disinfection.

Amos J. Cook, health officer of Leighton township, Allegan county, in his special final report of an outbreak of scarlet fever in which two cases occurred, reported substantially as follows with reference to methods of restriction enforced:

Both patients were isolated; three pounds of sulphur per thousand cubic feet of air-space was burned in all rooms; the contents of the privy disinfected with "a pail full of quick lime" and a "pail full of strong copperas water"; all bed clothes were exposed to fumes of burning sulphur; sheets, pillow-cases, etc., washed in carbolic acid solution; discharges were carried about 100 feet from dwelling, put into a hole two feet deep covered with lime and hole filled with earth. After the outbreak was over the clothing of the nurses was washed in a solution of carbolic acid.

J. K. Nevin, M. D., health officer of the village of Ironwood, Gogebic county, writes of an outbreak in his jurisdiction substantially as follows:

Both patients were kept isolated, three pounds of sulphur per 1,000 cubic feet of air-space was burned in all the rooms in the house, privy was disinfected by burning sulphur, discharges were burned and buried, nurses' clothing disinfected by fumes of burning sulphur, funeral of patient that died was private, no one attending but father and mother.

## VIOLATION OF PUBLIC-HEALTH LAWS.

The following extracts from letters, etc., received at this office illustrate how the health laws are frequently violated, and the disease thus allowed to spread.

\* \* \* "The circumstances connected with the outbreak here have been somewhat peculiar. The first cases excited little attention, and parties did not call a doctor, or report them to the health officer. The next case was a near neighbor, a little girl. She was attended by an old quack, (female) who frankly admitted that she did not know what was the matter, so I have been told since, but the case was not reported, and the child, before desquamation was completed, was sent to school. Then followed the four cases that just came under my notice. \* \* \* Two cases were attended by a physician from Petoskey, who simply pronounced them Scarlet Rash, without giving any caution, without informing the health officer and without placarding the house, leaving the people in the undisturbed possession of the false idea that many of the people here hold, *i. e.* that Scarlet Rash is not Scarlet Fever, and not at all dangerous.

"The physician above referred to has since, however, sent a message advising caution upon the part of the people, but altogether too late. It is my opinion, however, that every case has come directly from the first cases that were unreported and in which no precautions were used." \* \* \* *Dr. J. R. Ray, health officer, Boyne Valley township, Charlevoix county. From report of Dec. 26, 1888.*

In the outbreak which called forth the letter from which the above extracts are taken, there were fifty-two cases within one month. The contagium was carried from this jurisdiction, to Wilson township, same county, with a result of thirteen cases in the latter township.

"A family visiting in the north part of the State, were exposed there, one child on their return came down with the disease; no physician; no report; child sent to school, from which exposure eight new cases came down in the course of two weeks." *Dr. E. N. Palmer, health officer, Columbia township, Jackson county. From special final report of April 24, 1888.*

"The disease was introduced into this neighborhood by a child brought from Canada. I saw this case only once, and at that time diagnosed it as German Measles, but have since changed my opinion." \* \*

The method of disinfection was, "Burning sulphur, but it was done very carelessly, and in some cases not at all, no matter how urgently requested, in some houses the families remained in their houses, and even in the rooms during disinfection, so you can judge how poorly it was done." \* \*

In regard to isolation; "I tried to have it done, but it was never followed up according to my directions." *Dr. James Yates, health officer, Erin township, Macomb county. From special final report of June 23, 1888.*

In the above outbreak there occurred "about fifty cases" and one death.

A physician who is health officer of an inland city in the southern part of the State reports an outbreak of scarlet fever, in which the requirements of the health laws, and the rules of the State Board of Health were entirely ignored. In reply to the question, "Which of the patients were kept isolated from other people except nurse and physician," he answered "All," and in answer to how he did it, said: "by card and instructions." In reply to, "How were the discharges of the patient disinfected," replied: "With lime and ashes." As to the amount of sulphur burned: "Can't say." The funerals were conducted, "as quietly as possible."

There occurred 24 cases and one death in this outbreak. Had he taken the proper precautions as required by law, and met with the average success as noted in the table on page 230, he would have had only four cases in all. How many other jurisdictions were infected from this city was not learned.

#### PRACTICAL RESULTS IN RESTRICTING SCARLET FEVER.

In the compilation of the reports for the following table, showing the results obtained by isolation and disinfection, every effort is made to place the number of cases and deaths in each outbreak in their proper column. If, for instance, there were only one or two cases in an outbreak and the health officer neglected to isolate or disinfect, but for some reason the disease spread no further, the number of cases and deaths were placed in the column headed, "Isolation or disinfection or both neglected." If, on the other hand, as often occurs, quite a number of persons are exposed at the same time and place outside the health officer's jurisdiction, and by proper isolation and disinfection he succeeds in confining the disease to the original cases exposed, they are placed in the column headed, "Isolation and Disinfection Enforced." If, however, he neglects to properly isolate or disinfect, the whole numbers of these cases and deaths are placed in the "neglected" column. It is to be regretted that the majority of the reports received at this office do not state exactly what was done to restrict the disease, or lack that perspicuity which will enable the compilers to decide just what was done, and they are obliged to place all such in the column headed "Isolation or disinfection or both not mentioned, or statements doubtful."

It is evident from the following table and diagram that a great saving of health and life to the people of Michigan is being accomplished by those health officers who are striving to obey the laws, and to restrict this disease, and it is hoped that the perusal of this report will stimulate others to follow their example and assist in restricting and preventing this and other communicable diseases.

The following table \* differs somewhat from the tables to be found in

\* Whenever a break of 60 days or more has occurred in the progress of scarlet fever it has hitherto been regarded as two different outbreaks, but in estimating outbreaks for this table and the corresponding table for diphtheria, if the second appearance of the disease originated from the first the intermission was disregarded and it was treated as a single outbreak. Also, comparisons of years require that outbreaks be counted as closed at the close of the year; while in comparing outbreaks for testing the value of isolation and disinfection it is necessary to take complete outbreaks, even where they extend from one year into the next. This explains the apparent discrepancy between the number of outbreaks here given and the number given at the beginning of this article.

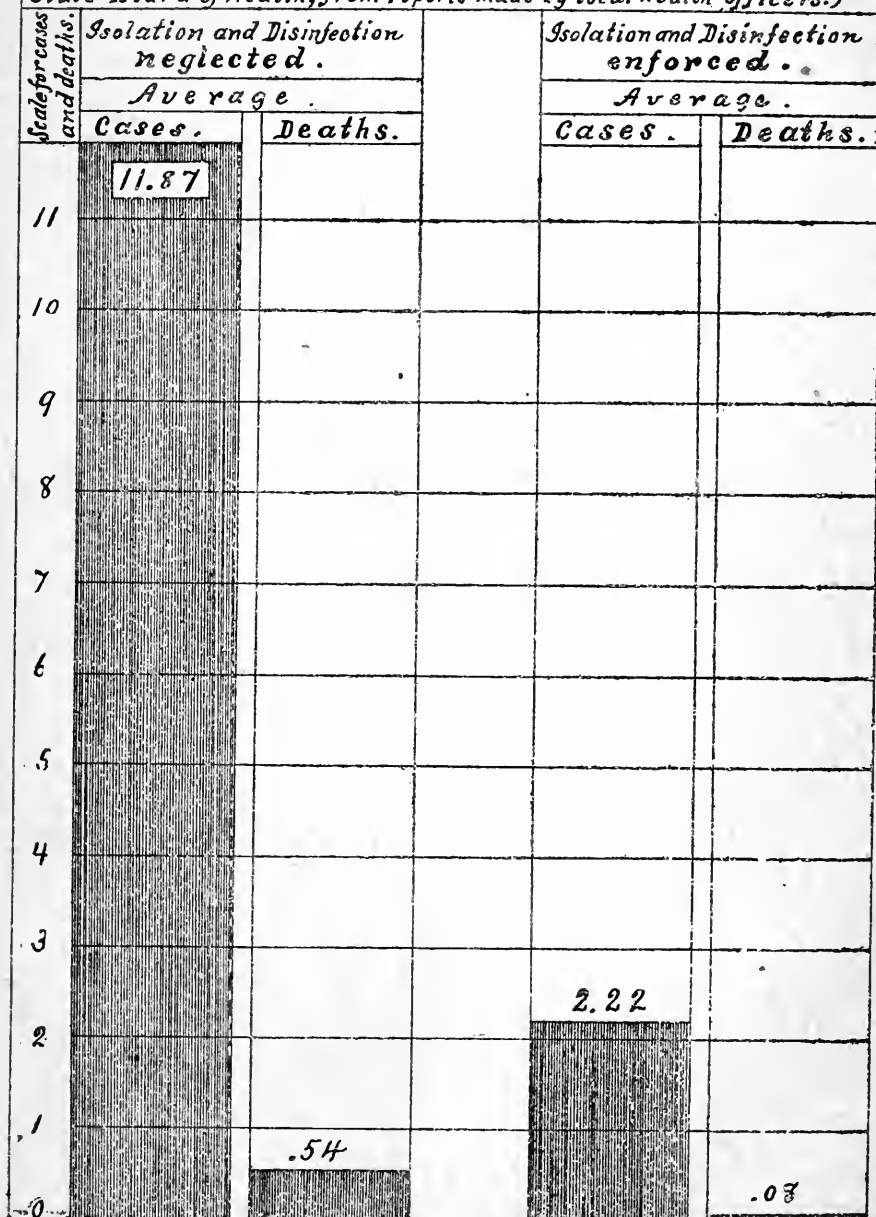
TABLE: Scarlet Fever in Michigan in 1888, Exhibiting the Average Number of Cases and Deaths per outbreak:—(1) in all the 340 outbreaks reported, (2) in the 225 outbreaks in which it is doubtful whether or not Disinfection or Isolation was secured, (3) in the twelve outbreaks in which Isolation was neglected, and Disinfection was enforced or doubtful, (4) in the 10 outbreaks in which Disinfection was neglected, and Isolation was enforced or doubtful, (5) in the 31 outbreaks in which Disinfection was enforced, and Disinfection was neglected or doubtful, (6) in the (9) outbreaks in which Disinfection was enforced, and Isolation was neglected or doubtful, (7) in the 61 outbreaks in which both Isolation and Disinfection were neglected, (8) in the 36 outbreaks in which both Isolation and Disinfection were enforced, and (9) in the 83 outbreaks in which Isolation or Disinfection or both were neglected.

	(1) All Outbreaks,* (340 Outbreaks.)		(2) Isolation or Disinfection or both not men- tioned or State- ments doubtful. (225 Outbreaks.)		(3) Isolation Neglected, Disin- fection enforced or doubtful. (12 Outbreaks.)		(4) Disinfection Neglected, Iso- lation enforced, or doubtful. (10 Outbreaks.)		(5) Isolation Enforced, Disin- fection neglected or doubtful. (31 Outbreaks.)		(6) Disinfection Enforced, Isolation negl- ed or doubtful. (9 Outbreaks.)		(7) Isolation and Disinfection both Neglected. (61 Outbreaks.)		(8) Isolation and Disinfection both Enforced. (36 Outbreaks.)		(9) Isolation or Disinfection or both Neglected. (83 Outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals.....	1,838	112	955	74	66	4	29	2	78	3	60	3	724	33	80	3	819	39
Averages.....	5.41	.33	4.24	.33	5.50	.33	2.90	.20	2.52	.10	6.67	.33	11.87	.54	2.22	.08	9.87	.47

\*These do not include the cases in Detroit and Grand Rapids, because of the difficulty in determining the beginning and ending of an outbreak in these cities, in which the disease is present in some part of the city nearly all of the time.



*Scarlet Fever in Michigan in 1888:- Exhibiting the average numbers of cases and deaths per outbreak:- in those outbreaks in which Isolation and Disinfection were both Neglected; and in those outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)*



## RESTRICTION OF SCARLET FEVER IN MICHIGAN.

TABLE: Exhibiting for the three years, and for each of the three years, 1886-8, the numbers of reported Outbreaks, Cases and Deaths; also, for this three-year period, the Average numbers of Cases and Deaths per Outbreak, in all Outbreaks; in those Outbreaks in which Isolation or Disinfection or both were doubtful; Isolation or Disinfection neglected; Isolation and Disinfection both neglected; Isolation and Disinfection both enforced; and, also, the numbers of Cases and Deaths indicated as having been prevented by Isolation and Disinfection.

Years.	All Outbreaks.*			Isolation or Disinfection or both not mentioned or Statements Doubtful.			Isolation or Disinfection or both Neglected.			Isolation and Disinfection both Enforced.			Cases and Deaths Indicated as having been prevented by Isolation and Disinfection.	
	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Cases.	Deaths.
1886.....	324	1,716	100	221	934	43	45	623	46	+	+	+	2,768	230
1887.....	299	1,882	141	190	1,200	93	45	534	37	32	440	34	2,885	221
1888.....	340	1,838	112	225	955	74	83	819	39	61	724	33	2,198	72
Totals.....	963	5,436	353	636	3,089	210	173	1,976	122	93	1,164	67	7,851	533
Averages, Three Years	321	1,812	118	212	1,030	70	58	659	41	47	582	34	2,617	174
Av. Cases and Deaths per Outbreak.....	.....	5.04	.37	.....	4.80	.33	.....	11.42	.71	.....	12.52	.72	2.45	.36

\* Outbreaks in Detroit and Grand Rapids not included.

+ Compilations for this column were first made in the year 1887.

‡ These results are obtained by multiplying the total number of outbreaks for the year by the average number of cases (13.84) or deaths (1.02) per outbreak, which is obtained from the column "Isolation or Disinfection Neglected," and deducting from the results thus obtained the number of cases and deaths which did occur in the year 1888.

§ These results are obtained in the same manner as noted in the last foot-note above, except that the averages by which the whole number of outbreaks for each year is multiplied, are obtained from the column "Isolation and Disinfection both Neglected."

|| Averages for two years, 1887-8.

¶ Averages, cases and deaths, per outbreak for the two years, 1887-8.

the Annual Reports of this board for the years 1887-8, in this:—That an effort has been made in the present compilation to show the results of restriction when only one mode (either isolation or disinfection) was practiced, and when both were neglected. The first, second, eighth and ninth columns are compiled on the same principle as those in the tables in the reports for the preceding two years. The number of outbreaks that can be used in the third, fourth, fifth and sixth columns in the table is comparatively small.

In the preceding tables and diagram are exhibited the results obtained by health officers in Michigan in the restriction of scarlet fever by isolation and disinfection and the comparison of these results with those obtained when one or both of these measures were neglected. From this table it may be seen that during the three years ending Dec. 31, 1888, there were reported to the office of the State Board of Health 963 outbreaks of scarlet fever, with 5,436 cases of sickness and 353 deaths. Had isolation and disinfection been enforced in each of these 963 outbreaks, and the average remained the same as in the 158 outbreaks in which they were enforced, the number of cases of sickness would have been reduced to 2,359 and the deaths to 154. From this it will be seen that there occurred 3,077 cases of sickness and 199 deaths through the neglect of health officers to properly isolate and disinfect. It has also been shown in the article on diphtheria that there occurred 5,780 cases of sickness and 804 deaths from diphtheria during the same period, that could and should have been prevented. Thus a total of 8,857 cases of sickness and 1,003 deaths occurred in the three years, 1886-8, from these two diseases that could have been prevented. Further, it may be seen that had no efforts at restriction been made, and had the average numbers of cases and deaths per outbreak remained the same as in the column "Isolation or disinfection or both neglected," there would have occurred 10,997 cases of sickness and 684 deaths from scarlet fever, and 15,526 cases of sickness and 3,204 deaths from diphtheria,—or a grand total of 26,523 cases of sickness and 3,888 deaths from the two diseases during the three years 1886-88. If we deduct the number of cases of sickness (12,371) and deaths (1,894) that *did* occur, we have 14,152 cases of sickness and 1,994 deaths that were prevented during the three years, 1886-88, by the measures recommended by the State Board of Health.

To those health officers who were faithful in their efforts at restriction, these results must afford great satisfaction; to those who were negligent of duty, they should be a powerful incentive to increased diligence.

For the five years, 1869-73, the average number of reported deaths per year from scarlet fever in Michigan, according to the Registration Reports published by the Secretary of State, was 589, or 4.85 deaths per 10,000 estimated average population. The Michigan State Board of Health was organized in 1873. For the next 12 years, 1874-85, the average number of reported deaths per year was 425 or 2.61 per 10,000 estimated average population for those years, or 4,376 less deaths from scarlet fever, than would have occurred had the average remained the same as it was for the five years, 1869-73, before the Board was established.\*

\*The average deaths per year from scarlet fever per 10,000 estimated population in the State of Massachusetts, for the twelve years 1874-85, is stated as 4.43. (46th Registration Report, Mass. 1887.) The State Board of Health of Massachusetts was established in 1869; but it has not until recently pursued the same methods as those which have been so successful in Michigan.

## SEQUELÆ OF SCARLET FEVER.

Scarlet fever is a disease to be dreaded on account of the mortality which it causes, and also on account of the permanent injuries which result from it, thus: 263 pupils in the Michigan State School for the Deaf at Flint, during the years 1887-8, who became deaf since their birth, the loss of hearing of 42, or 16 per cent, is attributed to scarlet fever.\* Of the 114 pupils in the Michigan State School for the Blind, at Lansing, during the two years, 1887-8, who became blind since birth, 7 or 6.1 per cent lost their sight from the effects of scarlet fever.†

## SOURCE OF CONTAGIUM OF SCARLET FEVER.

Of the 381 outbreaks of scarlet fever reported during the year 1888, and exhibited in the following table, the local health officers reported the source of contagium as follows:—Traced to a former case, 73; probably to a former case, 33; unsanitary conditions, 1; unknown, 139; and for 135 outbreaks the source of contagium was not given. The sources of nine outbreaks were traced to the city of Detroit, and of six to places outside of the State.

Reported Source of Contagium of Scarlet Fever in 1888.	Outbreaks.
Traced to a former case.....	73
Probably to a former case.....	33
Unsanitary conditions.....	1
Unknown (including "Sporadic" 4, "Spontaneous" 3, "Epidemic" 1.).....	139
Not reported.....	135
All outbreaks‡.....	381

*Traced to a former case, and How Scarlet Fever is Spread.*

Below are given a few quotations from statements of health officers, which illustrate how the disease is spread.

It is evident from some of these statements that patients are often allowed, while convalescing, to mingle with the family and with the public, before exfoliation or the peeling of the skin ceases, thus communicating the disease to others.

Below is given a copy of a letter received at this office which illustrates the manner in which contagious disease is often spread.

"I send you the following alleged facts, which I hope may be of some benefit to you in preventing the spread of contagious diseases in other places, if not here. On Nov. 3, 1888, the owner of lot C (diagram of village not shown), was permitted to bring her child, who had died of scarlet fever, from T— here, and by our authorities allowed to hold a public funeral at her residence. Whether any means of disinfection were used or not, I am ignorant. A lady who attended the funeral, called, and spent part of the day afterward, (coming direct from the house), at the residence on lot 10. On Nov. 16, Harry, aged 16, living on lot 10, was taken sick with the simple variety. Reported

\* 18th Biennial Report of the Board of Trustees of the Michigan School for the Deaf.

† Report of the Supt. of Public Instruction, Michigan, 1888, pages 73-80.

‡ See foot-note, page 229.

the case verbally to the proper authority, and no action was taken while three children of the same family continued going to school. Nov. 20, B—, aged 6, in same family, was taken very sick with the angnose variety, and is not convalescent at this date. Again report was made, and after appeal was made by myself to school board, the three children were removed from school. Dec. 3, L—, aged 12, was taken sick. Dec. 5, a six month babe, and Dec. 7, J—, aged 2 years, all in same family, were taken down with same disease. Dec. 5, a little girl aged 4, living on lot 5, was taken sick with scarlet fever; then on Dec. 9, two young pupils of our school, Nellie, aged 17, and Florence, aged 11, came down, making in all 8 cases, so far, as the result of transporting a body, and holding a public funeral, followed at least by a *great indifference* of the health authorities here. As the school is not closed, the end is not yet." \* \* \*

As an illustration of how the office of the State Board is sometimes able to aid local boards of health by suggesting methods for restricting the spread of communicable diseases, the following letter is presented:—

Health Officer of.....

....., Mich.,

LANSING, Mich., Dec. 14, 1888.

DEAR SIR:—Your notice of outbreak of scarlet fever dated Dec. 9 was received Dec. 13. Dec. 12, I mailed you the regular letter on that subject, notice having been previously received from another source. It is alleged that the authorities in B— allowed the body of a child dead from scarlet fever to come from ——— into your jurisdiction, and that a *public funeral* was allowed, and that already eight (8) cases have resulted in your village. Is it true that a public funeral was allowed? Your notice of outbreak only says four (4) cases have come to your knowledge. Perhaps diligent search may reveal the other four cases and help prevent further spread. It is alleged that the cases were "reported verbally to proper authority, no action was taken, three of the children in the same family continued going to school."

At least one of these cases (a boy aged 16) was taken sick as long ago as Nov. 16, and Nov. 26 another was taken sick; also Dec. 3, one; Dec. 5, one; and Dec. 7, one; Dec. 5, a girl aged 4 in another family; Dec. 9, two foreign pupils in school, Nellie, aged 17, and Florence, aged 11. I mention these details so that in case they were reported to some other officer than yourself, you may be able to look them up.

Very respectfully,

HENRY B. BAKER,

Secretary.

"Patient visited friends at Caledonia, Kent county, and there was exposed to the disease." *Dr. John P. Ferguson, health officer, Thornapple township, Barry county.*

"Contagium was brought into the family by father of child being away and in contact with cases. Carried it home." *Dr. D. E. Fuller, health officer, Hastings, Barry county.*

"By a little child from Boyne Valley township visiting at her grandfather's." *A. B. Goucher, health officer, Wilson township, Charlevoix county.*

"It was shipped here from the State Farm, known as the Agricultural College." *Dr. N. A. Dyer, health officer, Bath township, Clinton county.*

"First case was brought into the town by a party going a visiting, in township of Perry, Shiawassee county, and the second case was brought from Oakland county by a young lady, and from the last exposure five deaths occurred." *James W. Goodfellow, health officer, Venice township, Shiawassee county.*

"Contagion carried in clothing from Detroit." *Dr. W. K. Moore, health officer, Algonac village, St. Clair county.*

"Associating with a child having scarlet fever attending school in a neighboring township." *Dr. C. R. Dewey, health officer, Keeler township, Van Buren county.*

"About April 4 or 5, the family of Mr. Dates, of Detroit, was visiting the family of Hugh Peters, of this township; the first or second day of this visit a little son of Dates' came down with scarlet fever, and they immediately returned to Detroit. The Peters children had the disease, also the Crosby children—lightly. I did not take immediate charge of these cases, they being slight, and the danger of the disease spreading not being great. \* \* \* Some pretense at disinfection, but probably nothing thorough was done." *I. J. Bradner, health officer, Livonia township, Wayne county.*

"It was brought in a trunk among clothing." *Dr. Isaac Vorheis, health officer, Frankfort village, Benzie county.*

"I have recently found the origin of these scattering cases in town. It seems that in September a child brought the disease from Hillsdale, but in such a mild form that its nature was not recognized by the parents, and no doctor being called the child attended school throughout the attack. Since then there has been at least three similar cases that have attended school without missing a day, the fever and malaise not being sufficient to keep the child from school, and the nature of the trouble being made known only by the sequelæ. I have closed the school for a week and thoroughly fumigated the building by burning sulphur, 25 lbs. sulphur to a room 18x30x40, which I consider sufficient, there being no carpets or anything but ordinary school furniture." *Dr. G. A. Haynes, health officer, Homer village, Calhoun county.*

"The patient's sister evidently brought it from Grand Ledge on her clothes, as she had visited a house in which they had two cases of the fever." *Dr. H. N. Swaney, health officer, Eagle township, Clinton county.*

Dr. G. E. Corbin, health officer of the village of St. Johns, Clinton county, reported a case of scarlet fever taken sick July 8, "just eight days after her return from a visit in the south part of the State where her mother heard of no cases at all; contracted on the cars probably." The patient was reported a month later as having recovered. On August 16 several cousins of the patient came from Litchfield township, Hillsdale county, to visit her, and on Aug. 23 one of them, a child eight years of age, was taken sick. A brother of this last patient was allowed to return to Litchfield and was taken with the disease. Two other cases (and one death) occurred in Litchfield township in this outbreak. Dr. Corbin says with reference to the case of August 8:—

"In justice to Mr. and Mrs. Weatherwax I have to report that they fumigated each room, cellar and garret, thoroughly with sulphur, so thorough as to kill the grass near the cellar window, but they doubtless did it too early—too soon. They did it about the first of August, and about three weeks from date of attack, just as soon as child was around. *Cuticle peeled more or less after that.*"

Here is where the mistake was made; had they kept the patient isolated and waited until the cuticle stopped peeling, and then thoroughly fumigated, there probably would have been no second case and no outbreak at Litchfield.

"Since reporting this outbreak I have been able to trace source of contagium. Robinson is the name of family where disease first appeared. Mrs. Robinson's sister in Indiana had attack of scarlet fever. Soon after she shipped a small box of clothing to Mrs. Robinson. Seven days after receiving the goods Robinson's two children were attacked with scarlet fever. Four days later the other two children came down with it." *Dr. A. J. Collar, health officer, Ellsworth township, Lake county.*

"I received your notice of the 22nd, and had some difficulty in locating the family in question, but finally succeeded, but too late to prevent a considerable spread of the disease. When I found the place, it being in the country, I found a family there from the township of Colfax with two children but I have been unable to notify the health officer of that town of their being exposed, so I thought I would notify you and you could attend to it." *Dr. J. S. Clark, health officer, Chippewa township, Mecosta county.*

"A child was brought into the family where the disease first occurred, who had recovered from scarlatina six weeks previous. The child came from Mecosta county, the mother being assured by a physician, there that there was no danger of carrying the disease." *Dr. C. M. Martin, health officer, Eureka township, Montcalm county.*

"Unknown, except from a physician from 20 miles away, who was called to the place in consultation, and fondled the child. This M. D. at home was treating this disease." *Dr. Howard Cary, health officer, Crosswell village, Sanilac county.*

"By nurse in a family affected with the disease in neighborhood calling on the family of Warner Smith." *Dr. Myron Briggs, health officer, Speaker township, Sanilac county.*

"We have at present good illustration of spread of scarlet fever by schools. All through summer only now and then sporadic cases; school opened first Monday in September, and the disease already (Sept. 30) in every ward in the city and epidemic, mild, however, as yet, and no deaths." *Dr. E. P. Christian, health officer, Wyandotte.*

#### SCARLET FEVER IN BROOKLYN VILLAGE, JACKSON COUNTY.

On or about Nov. 1, 1888, the body of a child said to have died from typhoid fever was brought from Tompkins Center to Brooklyn village for burial. It is reported that the ceremonies over the body were attended by fifteen or more people, besides the members of the family, and that immediately after the funeral a lady, who had attended the same, spent the greater portion of the day with a family residing in a house on the second lot from the premises where the funeral was held. Sixteen days later scarlet fever made its appearance in the family where this lady visited. This case was followed by four others in the same family, the last case in this family occurring December 5. It is alleged that children of this family were allowed to attend school after the first case occurred. A child residing in another section of the village was also taken with the disease on Dec. 5. The parents of this last child are said to be relatives of the family in which the child sick with "typhoid fever" died, and had frequently called upon the afflicted family while their child was sick. Two other children residing in the country, but attending school in the village, were taken sick with scarlet fever, and are supposed to have received the contagium from the children of the first family who attended the school after the first case was taken sick. The question arises whether or not the person whose body was brought to the village for burial (alleged to have died with typhoid fever), communicated scarlet fever? The health officer and the attending physician assert that the person had not had scarlet fever, while another correspondent of this office conveys the idea that that was the origin of this outbreak of scarlet fever in Brooklyn.

The health officer in his annual report to this office reports eight cases. Another correspondent reports the number of cases as twelve. No deaths were reported.

#### VITALITY OF THE SCARLET FEVER CONTAGIUM.

The following extracts from reports received at the office of the Secretary from local health officers and others may be of interest in the study of the poison that produces scarlet fever. It is believed that this "poison may remain in clothing, etc., for a long time, possibly for years, especially if woolen and packed away in drawers or trunks."

Dr. J. K. Nevin, health officer of Ironwood, gives the source of contagium of an outbreak of scarlet fever, July 20, 1888, in that city as follows:—

"A visitor from Stevens point, who had recovered from the disease about six weeks previous to her coming here."

"The patient was working at Deer Lake, Pinora township, seven miles from here, when exposed to the disease. Came here a few days before she was taken down. I learned from Dr. Hammond that she was working in a family in a house where four years ago they had scarlet fever; one year ago another family were living in the house and their children came down with the fever after playing with some old clothing and furniture left in the garret by the family who lived there three years before. Of these children sick one year ago, one died and two recovered. Now this patient, Mrs. Henninger, cleaned up this same garret and handled some of the same furniture, etc., last

week and is now down with the fever. Thinking these facts might be of interest to you, I give them as gathered by me." *Dr. A. J. Collar, health officer, Ellsworth township, Lake county.*

"The first case occurred (June 13) in a family in which the disease existed last winter. It is very probable that the contagious principle was packed away in clothes at that time and opened this summer. In an outbreak such as the one above, where the cases were very light, I have found it impossible to isolate even the family, let alone the well members of it. Nothing short of a watchman with a shotgun will do it." *Dr. J. R. Humphrey, health officer, Michigamme township, Marquette county.*

"The case now (Nov. 29) reported was contracted in a house where they had scarlet fever last May, at least that is the result of my investigation." *Dr. J. G. Just, health officer, Maple township, Montcalm county.*

"Learned that the family where the disease first made its appearance had received some clothing some time previous from relatives living in Detroit who had had the disease about two years previous. The above is the only source of contagium learned of." *O. C. Campbell, clerk, Commerce township, Oakland county.*

"Some six years ago these parents lost three children from malignant scarlatina, and possibly the germ was retained about the premises." *Dr. V. Sinz, health officer, Chester township, Ottawa county.*

#### REPORTED PERIOD OF INCUBATION OF SCARLET FEVER.

The average period of incubation as given in the first of the following tables is 8 days, the same as it is in a similar table in the annual report from this office for the year 1887. In the second table the average is .8 of a day longer than it is in a similar table for 1887.

TABLE :—*Exhibiting the Reported Period of Incubation, in Days, for Scarlet Fever, in thirty-nine instances. Compiled from reports of Health Officers, received in the year 1888.*

Period stated in days.....	Period of Incubation.									
	2	5	6	7	9	10	11	13	14	21
Number of instances in each period	4	6	1	8*	7†	7‡	3§	1	1**	1

\*In one of these cases it was reported as "about seven days."

†In one of these cases it was reported as "about nine days."

‡In two of these cases it was reported as "about ten days."

§In one of these cases it was reported as "about eleven days."

\*\*"About fourteen days."

The average length of the period of incubation, for the 39 instances, is 8 days.

TABLE :—*Exhibiting relative to twelve instances of Scarlet Fever in Michigan in 1888, the Reported Period of Incubation within certain limits, stated in days; also the Means, the average of which may represent the average Period of Incubation.*

Days (in four instances).	Means.	Days (in four instances).	Means.	Days (in four instances).	Means.
1 to 21.....	11.	4 to 5.....	4.5	5 to 20.....	12.5
2 to 8.....	5.	4 to 5.....	4.5	5 to 22.....	13.5
3 to 10.....	6.5	4 to 5.....	4.5	6 to 20.....	13.
3 to 21.....	12.	5 to 10.....	7.5	8 to 10.....	9.

The average of the means in the above mentioned twelve instances is 8.6 days.



# TYPHOID FEVER IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1888.

There were reported to the office of the Secretary of the Michigan State Board of Health, during the year 1888, 1,151 cases of, and 310 deaths from sickness from typhoid fever in 296 localities. No reports of this disease were received from the following twelve counties: Alger, Alpena, Benzie, Genesee, Isle Royal, Manitou, Montmorency, Ogemaw, Oscoda, Presque Isle, Roscommon, and Schoolcraft. Over one-third of the above cases and deaths occurred in six counties, viz.: Kalamazoo, 110 cases, 10 deaths; Kent, 101 cases, 37 deaths; Cheboygan, 89 cases, 19 deaths; Manistee, 85 cases, 8 deaths; Menominee, 68 cases, 6 deaths; and Lenawee, 59 cases, and 11 deaths.

The following table gives the number of outbreaks, localities, cases, and deaths, average number of cases per outbreak, average number of deaths per outbreak, per cent of deaths to cases, and the number of special final reports received, for the five years, 1884-8:

TABLE 1—TYPHOID FEVER.—*Exhibiting the number of Outbreaks, Localities, Cases, and Deaths reported for each of the five years 1884-88; also for some of those years, the average Cases and Deaths per Outbreak, the Per Cent of Deaths to Cases, and the number of Special Final reports received.*

Years.	Outbreaks Reported.	Localities Reported.	Cases Reported.	Deaths Reported.	Av. Cases per Outbreak.	Av. Deaths per Outbreak.	Per cent of deaths to cases.	Final Reports Received.
1884 .....	-----	245	969	290	-----	-----	27	-----
1885 .....	218	200	715	194	3.28	.89	23	-----
1886 .....	290	282	1,194	282	4.15	.75	18	60
1887 .....	335	320	2,424	411	*7.24	*1.23	17	46
1888 .....	316	296	1,511	310	4.78	.98	21	60

\* The large average number of cases and deaths per outbreak in 1887 is partially accounted for by the fact that in two outbreaks the disease became epidemic, resulting in an aggregate of 535 cases and 73 deaths.

As shown in the above table there were reported to this office 913 cases and 101 deaths less for the year 1888 than for the preceding year. The average number of cases per outbreak for the year 1888 is 2.46 less than for 1887. This is explained in part by the fact that, during the year 1888, there occurred no serious epidemics of this disease, whereas, during the preceding year there occurred two such epidemics—one at Iron Mountain, with 300 cases, and the other at Manistee, with 235 cases. However, setting aside these two outbreaks, we find that the average number of cases and deaths (5.67 cases, 1.02 deaths) per outbreak, for the year 1887, was greater than for the previous years or succeeding year, 1888.

Reports received at this office show this disease to have been more fatal during the present year than for the previous two years, there being 4 per cent more deaths to cases.

## SOURCE OF CONTAGIUM OF TYPHOID FEVER.

The following table gives the number of reports for each source of typhoid fever as reported by the local health officers. Casting aside those

reported as coming from "outside of jurisdiction," "unknown," and those in which nothing was said about source of contagium, we find that 52 per cent of the balance attribute the source of infection to the use of infected or bad water, and 28 per cent *supposed* it to be bad water.

TABLE 7.—*Exhibiting the reported "Source of Contagium" of Typhoid Fever in Michigan, during the year 1888.*

Reported Source of Contagium.	Number of Reports for each Source of Contagium.
Infected or impure water.....	43
Supposed to be bad water.....	23
Bad sanitary surroundings.....	9
"Filth".....	4
"Privy near dwelling".....	2
"Bad sewage".....	2
From outside of jurisdiction.....	32
Unknown (including "Endemic," 1; "Sporadic," 2; "Overwork," 2).....	95
No source stated.....	106

Below are given extracts from statements found in the reports of local health officers with regard to the source of the contagium of typhoid fever.

Of an outbreak in Iron Mountain city, which began about August 5, 1888, and ended January 25, 1889, and during which time about 30 cases and 5 deaths occurred, Dr. J. M. Mead, the health officer, writes that the source of contagium was from "Drinking impure water." From a plat of the city, which he kindly forwarded to this office, with the locality of the fever marked, it is shown that all of the cases of the fever occurred within a space the size of one block, excepting one house, which was about 10 blocks distant. A ditch runs through the centre of the infected district from the Chapin mine. The doctor writes :

"All kinds of filth is thrown into this; dead cats, dogs, and pigs are often thrown in, besides slops, excreta, etc. I have closed the wells in the typhoid district, then all privies were disinfected with chloride of lime."

It may be noted here that in this city during 1887 there occurred about 300 cases and 45 deaths from typhoid fever, and the citizens are to be congratulated that their health officer, who by improvement of the water supply, disinfection, etc., has been enabled to restrict the disease to such a small territory during the present year.

Of an outbreak in the township of Watervliet, Berrien county, Dr. V. R. Foot, the health officer, writes :

"\* \* \* A well which is now and has been for nine or ten years, used for a privy vault, stands four rods from new well, which is 15 or 20 feet deeper than the old vault. Four months ago discharges from bowels of bilious diarrhea patient were deposited therein."

Dr. John I. Baker, health officer of Leroy township, Calhoun county, writes :

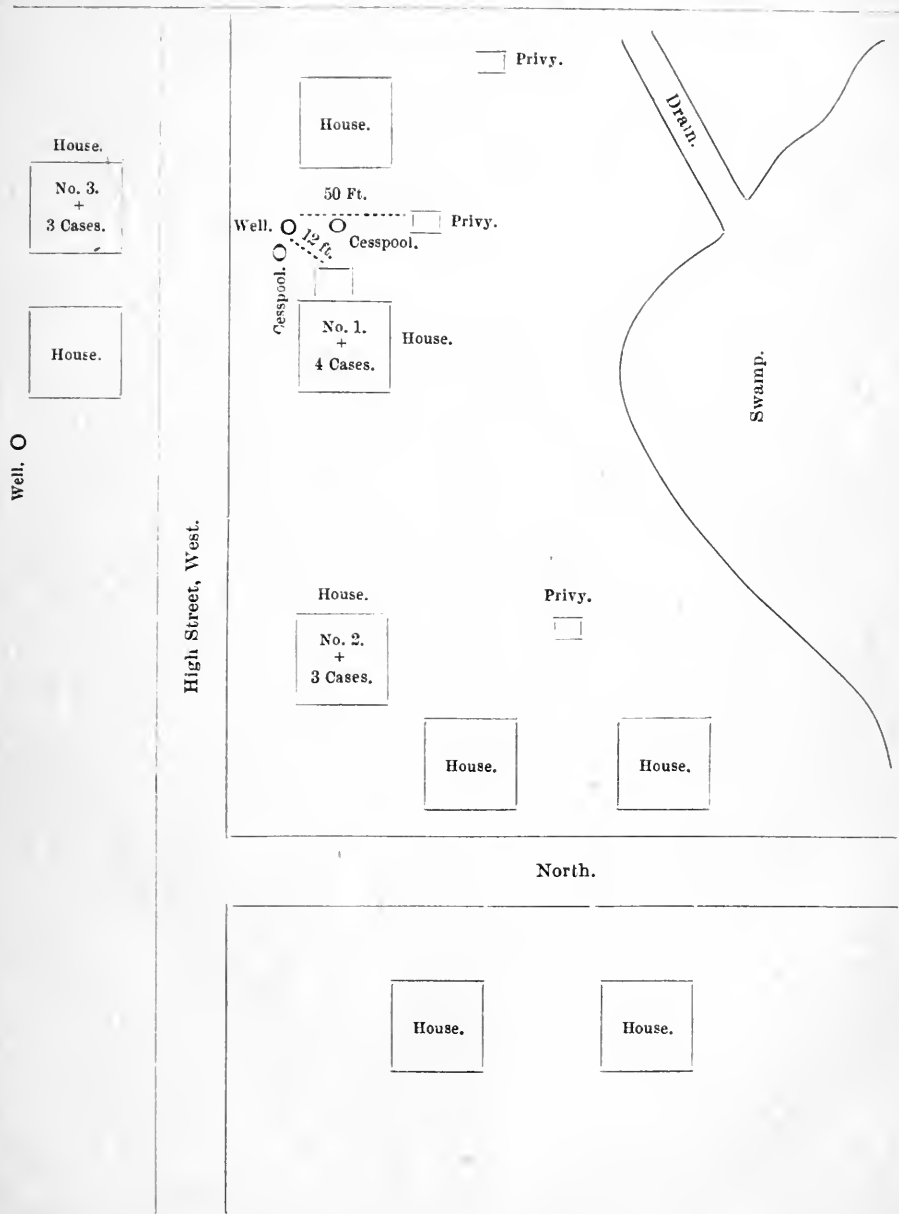
"Cases 1 and 2 from foul well, and bad cellar under house. Cases 3, 4 and 5, using drinking water from a spring near which was buried a horse some five months previously. This fact was not known to the people previous to their sickness."

## TYPHOID FEVER ATTRIBUTED TO BAD WELL-WATER.

Dr. E. Brumfield, health officer at Union City, reports to the State Board of Health as follows:—

UNION CITY, March 9, 1888.

Dr. Baker:—Enclosed is a report of cases of typhoid fever, which have occurred in Union City.



The disease above was called malarial and was not reported. The first case was in house No. 1, aged 25, taken sick June 2, '87, died June 30. His mother was taken sick July 27, '87, recovered after being sick about sixty days. Two sons were away from home until January, 1888, in about two weeks one was taken with the fever, is sick now. The youngest son was taken shortly after, and is sick now. The house No. 1 is where the fever started; in No. 2, there have been three cases; in No. 3, three cases last September. Persons in Nos. 1, 2, and 3 have used water from well at No. 1. Houses marked with + is where the fever occurred, others were free. Where the No. 1 house and well are it is high ground, well on level with the ground. West of the well the ground is four feet higher than the well. The soil is sandy. Surface water can run into the well. Wash water and slops were thrown on the ground close to said well.

I can learn but little from the family or the physician attending, concerning cases, but get from the neighbors and what I can see by going on the premises myself. Swamp north of Merritt's house about 150 feet, peaty soil. I am sure the above cases were caused by water from the No. 1 well, all except the first case. On testing water from said well I find it contains four grains putrid organic matter to each gallon. I have forbidden its use.

#### TYPHOID FEVER IN LANSING DURING 1838 (MAP ON OPPOSITE PAGE).

During the year 1888 a considerable number of cases of typhoid fever occurred in the city of Lansing. It was the belief of some of the physicians that a large number of cases were caused by emanations from the outlet of a sewer. Some of the earliest cases occurred near a break in a sewer, and it was considered that possibly the sewage filtered through the soil, and entered the well which supplied water to the family. This, however, was not proved. Dr. Marshall held that a large number of cases were caused by the foul outlet of the sewer. He prepared a large map of that portion of the city, marked it in a way to represent the cases of sickness under his observation, and the map was presented to the State Board of Health. A photo-engraved copy, reduced in size, is printed on the page opposite. It is proper to state that since then the end of the sewer has been extended. It now enters the river at a lower point.

Dr. S. A. St. Armour, health officer of Cheboygan village, writes in regard to an outbreak in which 31 cases and 2 deaths occurred, as follows:

"Bad drainage, filth, cesspools which contaminated the drinking water of a certain part of the town affected with sickness."

C. L. Watson, health officer of Wheeler township, Gratiot county, says of an outbreak in his jurisdiction:

"The well is only about three rods from the back door, where they throw all their slops. The woman took in washing, and all the slops wound their way into the well, the ground gradually descends from door to well."

Dr. G. G. Barnett, health officer of Tilden township, Marquette county, says:

"It was not brought from outside but developed at home from impure water. The disease prevails in that locality each year. In the last two years I have had eighty cases, most of them in Tilden township. They have no proper water-supply, which fact in my opinion accounts for the trouble."

Dr. C. M. Barnes, health officer of Fairplains township, Montcalm county, writes:

"This young girl had been living at a place where there had been five or six large hogs kept all the winter. The hog-pen and barn are quite near the well. \* \* I think every case of typhoid fever that has occurred in our town for the last five years has been there, or had its origin in Fenwick plainly traceable. \* \* \* It is entirely surrounded by marshes, some coming close to the garden, with the vaults draining into them, and they in turn draining into the wells, most of them supplied



with surface water. There have been two or three driven wells put in in the past year, but some will persist in using from wells that are near enough to filth to be contaminated by it."

Dr. R. M. Johnson, health officer of the township of Novi, Oakland county, states:

"From the drinking water, I think, as the well from which they used water seemed to be fed from a cesspool that gets the leachings of the barnyard."

Dr. W. C. Wells, of Newfield township, Oceana county, says:

"The well is old, open, wood curbed. Two dead mice were drawn out of the well a little before he was taken sick, one of them badly decomposed."

Many others report supposed sources to be the use of swamp water, water from old wells of which the curbing was wood and decayed. It is also evident that neglecting to properly disinfect in some previous outbreak has been the cause of more or less of the outbreaks thereafter, as some of the following extracts seem to prove.

Dr. O. A. La Crane, health officer of Berrien township, Berrien county, writes:—

"The first case occurred in a family that had the fever four years ago; no disinfectants were used, and there have been symptoms of typhoid fever every year since. No well marked case until this outbreak."

Dr. J. R. Nevins, health officer of Ironwood village, Gogebic county, states:—

\* \* \* "One peculiarity I notice is that every case so far reported, and all that have come under my personal observation are located in buildings which had typhoid patients last fall. I will pay particular attention to renovating and disinfecting of these premises."

#### TYPHOID FEVER REPORTED TO HAVE BEEN CAUSED BY DECAYING FISH ENTRAILS, AND ROTTING APPLES.

In reply to letters from this office, asking for full particulars, Dr. P. O. Wagener, health officer of Sand Beach village, Huron county, writes in regard to several outbreaks in his vicinity:—

\* \* \* "Two men took a load of fish gut from the shore to use as manure. They went to mix it with other manure after it had been there about two or three weeks. Five days afterwards one was taken with typhoid fever and died in four days. Two days later the other was taken and is now convalescent."

On a later date he writes:—

"In regard to your letter concerning typhoid fever, would say: That the said manure could not contain any secretions from any patient suffering from typhoid fever or any symptoms thereof. The fish gut was emptied in a box for that purpose by the fishermen. None of their crew were sick, and it was over one mile from any house and taken to the farm the same day, where it lay for about two weeks until it was mixed with other manure, nobody in the neighborhood being sick.

"The theory of micro-organism is very doubtful. I do and always did believe that any decomposing organic or inorganic matter may create the poison which produces the disease, and often had good proof to believe so.

\* \* \* "Last year we had a case here where a man stored some apples in a new boat, a lot of them became rotten and three men went to clean them out, all three were taken with typhoid. I attended them and attributed the cause to the decomposing apples. My assistant, Dr. Solomon, a scholar of Virchow, thought differently, because he knew the specific. He never visited the boat nor one of the patients, but I brought him some of the apples, and he began his examination with the microscope. He hunted germs for a week, but said, 'There is none in them.'

"The scientific chase he did at his bedroom. In eight days he was taken with typhoid, which kept him in bed eight weeks, and very near took him out of the land of germs into the land of spirits."

## SHEEP DIE WITH EVIDENCES OF TYPHOID FEVER.

In a letter of still later date, Dr. Wagener again refers to the two patients who handled the fish gut:—

"On May 12, I reported to you one case of typhoid fever. There had been two cases, but the first man died before I could see him. The source of contagium was as I at the time told you—a couple of loads of fish guts, which was brought to the premises to be used for manure. The two men mixed it with other manure and both took typhoid fever; one died within two days, the other recovered after six weeks.

"The disinfectants used were, first, oil to burn the manure entirely. The vessels in which all the discharges were taken up from the patients were kept half full of a solution of corrosive sublimate, 10 per cent. strong, the discharges remaining in them for fifteen minutes before being carried to the privy vault, no disinfectants being used in the privy. The patients were kept isolated from all other people except nurse and physician. \* \* \*

"A peculiar thing happened on the premises of the first case; the man had eight sheep, they ran all over the manure, and they afterwards took sick; lying down, breathing became heavy, and profuse perspiration came over them (!) The third and fourth day, some the fifth day, became comatose and all died. I had two of them opened and found well-known bowel lesions were as plain as possible. No doubt they died of typhoid fever. They were buried with caution, and a large quantity of corrosive sublimate and lime used to disinfect them."

## COMMUNICABILITY OF TYPHOID FEVER.

From reports, letters, etc., received at the office of the Secretary of the Michigan State Board of Health, it is evident that a great many people, and not a few physicians, believe that this disease is not communicable. Owing to the manner in which the typhoid fever germ or poison is generally transferred from the patient to another person, it is not so difficult to restrict as the majority of communicable diseases; but if the discharges from the bowels of the patient are thrown into privy vaults, or upon the ground from which they may percolate the earth to the water in the well, or some other water supply, there is great danger that the disease will be thus communicated to others. While it is believed that the drinking water is the principal agent which conveys the poison of this disease from one person to another, it is evident that there are other means by which this disease is communicated, such, for instance, as contaminated food or clothing, and, perhaps, the dust from dried human excreta.

On January 17, 1888, the following letter was received from A. E. Roberts, of Grand Rapids:—

"Does the State Board of Health consider typhoid fever a communicable disease and dangerous to the public health, and would it properly come under Sec. 1647 of Howell's Annotated Statutes?"

The following reply was sent from this office by the Secretary:—

\* \* \* "By this mail I send you two pamphlets issued by this Board, in one of which I have marked paragraphs from which you will see that in the opinion of the State Board of Health, typhoid fever is a disease dangerous to the public health, and, as such, comes under the provisions of the law relating to such diseases.

"While typhoid fever is a communicable disease, it is not one of the most contagious diseases, its most frequent method of spread being through the drinking water. Therefore, isolation of the patient is not so great a necessity as the disinfection of the discharges of the sick (see page 3 of the pamphlet on the prevention of typhoid fever sent herewith), and the boiling of all water used for drinking or culinary purposes."

The following quotations bearing on the communicability of typhoid fever, are taken from reports of health officers and clerks of local boards of health, who stated the source of contagium:—

\* \* \* "The other four were introduced from Iron River by a member of the family taking it at Iron River and then coming home."—*Thomas Farley, health officer of Nadeau township, Menominee county.*

"By going to Mears', in the next township, to take care of her sister, Mrs. G. H., who after that died. She helped to take care of her sister for several weeks and came home very tired; had that feeling for some three days when I was sent for. I called it typhoid and advised them to send for Dr. B. G. Covenough, who reported it typhoid."—*James Gibbs, health officer of Benona township, Oceana county.*

"The first case was taken in the lumber woods, near Oscoda, Mich., and came home with what was at first supposed to be remittent fever. All the cases occurred in one family. The family were ignorant Germans, and it is impossible to carry out full preventive measures."—*B. S. Gilbert, M. D., health officer of Sanilac township, Sanilac county.*

"Miss C., a young lady working at an hotel in Armada, went home to see her mother, who was sick with fever, and after ten days was taken sick with typhoid fever, which run two weeks. I think there were four or five cases from the same exposure."—*Dr. C. H. Lincoln, health officer of Armada township, Macomb county.*

#### NEGLECT OF HOUSEHOLDERS, PHYSICIANS, ETC., TO REPORT TYPHOID FEVER TO LOCAL HEALTH OFFICERS.

Complaints are often received at this office from local health officers, of the neglect of physicians, householders and others to report typhoid fever and other communicable diseases. As typhoid fever is now considered as one of the diseases which are "dangerous to the public health," it becomes the duty of every householder, hotel-keeper, keeper of a boarding house, tenant, or physician, to give immediate notice of the existence of such a disease within their knowledge, to the local health officer, the president or clerk of the local board of health of the township, city or village in which he resides. (See Sections 1675, 1676, Howell's Annotated Statutes, as amended by Act 11 of 1883; or Sections 41-42, pages 12 and 13, of the pamphlet, entitled, "Laws of Michigan relating to the Public Health," issued from this office in 1889).

C. R. Palmer, clerk of Maple Grove township, Barry county, in reporting an outbreak of typhoid fever, in which 17 cases and 2 deaths occurred within his township, says:—

"It was mostly confined to one locality, there being no less than eleven cases within one square mile. I make this report from my own observation and research, as there were only two or three cases reported to me either by friends or physicians. \* \* \* Please inform me whether it is necessary to report typhoid fever."

The following reply was sent:—

"Your letter concerning typhoid fever is received, for which please accept thanks. Documents concerning the restriction of that disease, and blanks for reporting to this office are sent to you by this mail; the health officer is also notified and provided with material.

"Typhoid fever is, in the opinion of this board, a 'disease dangerous to the public health,' and as such should be reported to the health officer by physicians and householders, and by him to the State Board of Health.

Very respectfully,

HENRY B. BAKER,

*Secretary.*"

Geo. F. Heath, health officer of Monroe, writes:—

"There is a disposition here among our physicians against the placarding of houses for typhoid fever. I insisted upon their doing this last year and it was done, and it enabled me to report such cases to you weekly, I think, for the first time in this city. This is the only way I have in reporting the disease to your Board intelligently.

"All must admit that it is contagious and infectious, and a disease of high mortality. Now the question is with me,—Have I a right to insist on this disease being reported to our local board, and



the placarding of houses where the disease is prevailing? If so, where is my authority? I have no desire to attempt to enforce anything of this kind without I have authority for it. Please enlighten me in the matter."

The following is a copy of the reply sent :—

"DEAR SIR:—In reply to your letter of April 23, I send you, by this mail, pamphlets with marked paragraphs answering the questions you ask. Typhoid fever is a disease *dangerous to the public health*, and as such comes under the law requiring such diseases to be reported, and public notice of infected places to be given."

Dr. J. N. Hathaway, health officer of Reynolds township, Montcalm county, writes :—

"I send you blank report *filled out*; the case was treated by a homœopathic physician and I did not know a case of typhoid fever existed in the township until after death of patient. I asked him about the case, etc., and found that he did not use any precautions whatever; not even were the stools disinfected, consequently my report is deficient in details."

#### EPIDEMICS WHICH SHOULD HAVE BEEN PREVENTED.

In connection with the severe outbreak of typhoid fever at Negaunee (where there occurred seventy-five to eighty cases) which the State Board of Health was called upon to investigate, it is of interest to know that that city had not complied with the law, which requires every city to have a physician for health officer,—no physician being willing to accept the position for the remuneration offered by the council. Each physician probably thought he could make more money treating a few of the citizens after they became sick than the entire city was willing to give for the prevention of sickness.

During the same week the State Board of Health was called upon to aid in restricting an epidemic of dysentery of a very severe type in the village of Stockbridge. In this outbreak there occurred eight deaths. Stockbridge also had failed to comply with the law requiring every village to have a physician for a health officer.

The list of health officers in Michigan published by the State Board of Health shows that this law is generally complied with,—forty-seven cities and one hundred and seventy-six villages having physicians as health officers. It is significant that two such unrestricted outbreaks should occur in one week in two localities in which the officers were delinquent—not complying with the law of the State on this subject.

#### EFFORTS MADE TO RESTRICT THE SPREAD OF TYPHOID FEVER.

For the purpose of restricting the spread of this disease the fecal discharges of the patients should be thoroughly disinfected with chloride of lime, and buried in the ground at a distance from any well, spring, or source of water-supply. A document, giving full instructions for the restriction and prevention of typhoid fever, has been issued by this State Board of Health, and a copy will be mailed to anyone who applies for it.

The following are examples of some of the replies of health officers and others to the question,—“How were the discharges of the patient disinfected?”

“By solution of copperas in the vessel in which discharges were received.” “With strong solution of corrosive sublimate in which they were left 30 minutes before they came to the privy.” “By the use of carbolic acid and sulphate of iron.” “Using of chloride of lime.” “By passing in solution of sulphate of iron and burying.” “By sulphate of iron and burying away from all wells, etc.”

A number report that, in addition, the rooms and clothing were fumigated with burning sulphur, burning at the rate of 3 pounds or more of sulphur to the 1,000 cubic feet of air-space, that the contents of the privy-vault were disinfected with chloride of lime, or sulphate of iron; and the majority state that their efforts proved successful, confining the outbreak to a few cases.

#### HOW NOT TO RESTRICT THE SPREAD OF TYPHOID FEVER.

The following extracts are taken from reports of health officers who do not seem to be aware of the great importance of thoroughly disinfecting the discharges. In answer to the same question,—“How were the discharges of the patient disinfected?” they replied:—

“They were buried in the ground.” “Buried in a deep hole away from the house, is all.” “Put in a fresh, dry hole, 3 feet deep, and fresh earth scattered over each.” “By being caught in vessels containing a solution of carbolic acid—1 to 20.”

The objection to the above-stated modes of disposal of the discharges is that, when buried without being disinfected, the poison may leach to and contaminate the water-supply, and thus cause a further spread of the disease.

#### TYPHOID FEVER IN PARK, ST. JOSEPH CO., MICH.

An interesting outbreak, which occurred in Park township, St. Joseph county, was reported by Dr. H. C. Clapp, health officer of Mendon, as follows:—

“MENDON, Michigan, Oct. 15, 1888.

“Dr. Henry B. Baker, Secretary of State Board of Health.

“DEAR DOCTOR:—Yesterday a family came into my hands, one and a half miles north of Parkville, St. Joseph county, where there are two sick with typho-malarial fever, in the second week. The father, mother, and one son have died in the same house within the past year of the same fever,—the last—the son—three weeks ago. Two others of the family—daughter and hired man—also had the fever and recovered during that time. Now two sons are very sick with it, and a daughter strongly threatened, and of course very much alarmed, with almost a panic in the neighborhood. Three different physicians have treated them, but failed to find cause. I have looked the premises over thoroughly, and cannot satisfy myself where the *matres morbi* is which is slaughtering this family. I was called in consultation over the daughter who recovered and the father who died, and then advised them to sink a well in another locality, which they did last June—a drive well. Since then the mother and son have sickened and died, and two now sick. I have directed them to boil both the water and milk before using, and to-day send you a jug of the well-water, requesting you to have it analysed by Prof. Kedzie or some one competent, and send me the result as soon as convenient. The well is now quite a distance from barn or privy, 18 feet deep—privy cleaned two years ago, land lies up high and dry, a sandy loam, cellar dry and clean and well ventilated, and no neighbors sick around them. Have lived there a great many years, and always well up to commencement of this endemic.

Truly yours,

H. C. CLAPP.”

It seems to me that this is a case in which it is very desirable to have chemical and biological examination of the water used. Accordingly the jug of water is sent to Prof. V. C. Vaughan, Director of Laboratory of Hygiene, Ann Arbor, with the request that, if possible, he will make, or cause to be made, such examination of the water as will, if possible, determine whether or not it contains the specific cause of typhoid fever.

Very respectfully,

HENRY B. BAKER,

Secretary.

LANSING, Mich., Oct. 16, 1888.

Below is given the results of the analysis:—

## CHEMICAL ANALYSIS.

	Parts per Million.	Grains per Gal.
Free Ammonia.....	0.02	0.0012
Albuminoid Ammonia.....	0.21	0.012+
Chlorine.....	34.0	1.9828
Nitrites.....	None.	.....
Nitrates.....	None.	.....
Hardness.....	11, on Clark's scale.	.....

No absolute standard for the chemical purity of drinking water can be given, but good authorities agree on the following:

1.—The chlorine ought not to exceed 10 parts per million.

According to this rule the above water is very bad.

2.—The Free Ammonia ought not to be more than 0.05 of a part.

There is no excess of Free Ammonia in the Mendon water.

3.—If 0.10 part of Albuminoid Ammonia be present the water should be regarded as suspicious, and the presence of 0.15 of a part or more of this substance should certainly condemn the water.

As will be seen, the Mendon water contains too much Albuminoid Ammonia.

## BACTERIOLOGICAL EXAMINATION.

The water contains 120 Bacteria in each drop.

No pathogenic germs were found, but the putrifactive micro-organisms were identified:

1.—A liquefying bacillus; a short, thick rod with rounded edges.

2.—Micrococcus candicans; this does not liquefy gelatine.

3.—A fluorescing bacillus; a short rod with rounded ends, and which does not liquefy gelatine.

Notwithstanding the fact that the typhoid germ was not found, the bad condition of the water, as shown by the chemical analysis and the large number of germs in it, should condemn its use for drinking purposes.

V. C. VAUGHAN, M. D.,

*Director of the Michigan State Laboratory of Hygiene.*

ANN ARBOR, February 1, 1889.

## AVERAGE DURATION OF TYPHOID FEVER.—FATAL AND NON-FATAL CASES.

From the following table it may be seen that of the 121 males who were reported to have died from typhoid fever within the two years 1887-8, and of which the interval between the day of being taken sick and day of death was given, the largest per cent died from the 20th to the 25th day of sickness, and that 61 per cent were sick twenty or more days before they died; while of the 65 females reported as having died in the same time, 28 per cent died before the tenth day, and that only 39 per cent were sick longer than nineteen days. The average duration for the fatal cases was, in males, twenty-three days, and in females, nineteen days.

TABLE 2.—*Exhibiting by Sex of patient, the Average Duration (in days) of fatal cases of sickness from Typhoid fever, in Michigan, during the two years, and during each of the two years 1887-8. (Compiled from those reports which stated the length of time the patient was sick.)*

Year.	Total Cases of Typhoid Fever.	No. of cases included in this table.	Duration of Sickness:—Per Cent of Deaths in each Period of Days.												
			All Cases.	Under 10 Days.	10 to 15	15 to 20	20 to 25	25 to 30	30 to 35	35 to 40	40 to 45	45 to 50	50 to 55	55 Days and over.	
1887.	Males.....	81	100	10	7	15	21	16	11	12	2	4	1	0	
	Females.....	32	100	31	19	19	16	6	3	0	0	6	0	0	
1888.	Males.....	40	100	20	13	18	23	10	8	0	5	3	3	0	
	Females.....	33	100	24	21	15	12	9	6	3	0	0	9	0	
Av. 1887-88.	Males.....	121	100	15	10	17	22	13	10	6	4	4	2	0	
	Females.....	65	100	28	20	17	14	8	5	2	0	3	5	0	

In the following table it may be noticed that the duration of sickness in *non-fatal* cases of typhoid fever for the two years, 1887-8, was about the same for both sexes; 61 per cent of the males and 58 per cent of the females recovered before the thirty-fifth day of sickness. The average duration was:—males 34 days, females 33 days.

The average duration of all cases, fatal and non-fatal, was:—males, 28.6 days, females, 26.4 days; and for all cases of both sexes, 27.5 days.

TABLE 3.—*Exhibiting, by Sex of patient, by per cent of cases which recovered in specified periods of time, the average duration (in days) of non-fatal cases of sickness from Typhoid fever, in Michigan, during the two years and during each of the two years 1887-88. (Compiled from those reports which stated the length of time the patient was sick.)*

Year.	Non-Fatal Cases of Typhoid Fever.	No. of cases included in this table.	Duration of Sickness:—Per Cent of Cases in each Period of Days.											
			All Periods.	Under 10 Days.	10 to 15	15 to 20	20 to 25	25 to 30	30 to 35	35 to 40	40 to 45	45 to 50	50 to 55	55 Days and over.
1887.	Males.....	203	100	0	5	6	12	16	18	15	9	6	3	8
	Females.....	158	100	0	9	9	19	12	17	11	6	4	3	9
1888.	Males.....	164	100	1	4	13	9	13	15	9	10	9	9	7
	Females.....	111	100	0	2	7	14	15	15	19	4	8	10	8
Av. 1887-88.	Males.....	367	100	1	5	10	11	15	17	12	10	8	6	8
	Females.....	269	100	0	6	8	17	14	16	15	5	6	7	9

#### AGE OF OCCURRENCE OF TYPHOID FEVER.

In studying the following table, relative to age of persons who have typhoid fever, it should be borne in mind that there are more persons liv-

ing at the earlier ages than at the more advanced ages. After the publication of the census of 1890 it will be possible to compare the following table with a table exhibiting the per cent of persons living in each period of age, and thus complete the study here provided for by this statement of facts relative to over one thousand cases of typhoid fever.

TABLE 4.--*Exhibiting by Sex of patient, the Age at which sickness from Typhoid fever occurred, in Michigan, during each of the two years, 1887 and 1888, and the average for the two years together with the number of cases reported in each of the two years, and the total for the two years. (Compiled from reports of those cases for which the Age was stated, and which came under the immediate notice of the physician who reported them.)*

Year.	Sickness from Typhoid Fever.	Average age. Years.	No. of cases included in this table.	Age,—in Periods of Years. Per Cent of Cases in each Period of Age.												
				All Ages.	Under 10 Years.	10 to 15	15 to 20	20 to 25	25 to 30	30 to 35	35 to 40	40 to 45	45 to 50	50 Years and over.		
1887.	Males.....	24	316	100	10	10	14	20	17	9	8	4	2	4		
	Females.....	22	245	100	17	10	20	15	10	10	5	4	3	5		
1888.	Males.....	24	310	100	12	13	15	20	11	11	5	4	3	6		
	Females.....	23	199	100	12	22	20	14	8	5	4	6	3	7		
Av. 1887-88	Males.....	24	626	100	11	12	15	20	14	10	7	4	3	5		
	Females.....	23	444	100	15	16	20	15	9	8	5	5	3	6		

#### TIME OF YEAR WHEN TYPHOID FEVER WAS MOST PREVALENT.

From the following table (5) it may be seen that in 1887 and in 1888 the greatest per cent of cases of typhoid fever were reported to have occurred, as would be expected, in the month following the one in which the greatest per cent of outbreaks were reported to have began. The two lines of evidence in the table thus corroborate each other.

According to the table, typhoid fever seems to have been more prevalent during the first six months in 1888 and less prevalent during the months of July, August and September in 1888 than during the same months in 1887. In 1887 only 18 per cent of all outbreaks occurred prior to August; while in 1888, 27 per cent,—an increase of one-half,—occurred prior to that month. The maximum per cent of outbreaks and cases per month was reached one month later in 1888 than in 1887.

TABLE 5.—*Exhibiting the number of Inches of Earth above the ground water in Lansing, by months for the years 1886-7 and 8, compared with the per cent of reported cases and outbreaks of Typhoid fever in Michigan, for each month: also the total number of cases and outbreaks reported for those years. (Compiled from those cases which were reported as coming under the immediate notice of the reporter; and from those outbreaks of which the time of beginning was stated.)*

Specifications relative to ground water and Typhoid fever.	Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	No. of cases and outbreaks included in this table.
Inches of earth above the water, year 1886.....	-----	276	278	274	272	273	277	282	287	287	286	291	294	-----
Per cent of cases of typhoid fever reported, year 1886*.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Per cent of outbreaks which began in each month, 1886.....	100	6	4	4	2	2	4	11	15	26	11	11	5	253
Inches of earth above the water, year 1887.....	-----	296	287	280	282	285	288	290	291	291	294	297	294	-----
Per cent of cases of typhoid fever reported, year 1887.....	100	2	1	1	1	2	3	8	20	24	19	12	7	1,096
Per cent of outbreaks which began in each month, 1887.....	100	5	2	2	3	6	4	12	23	20	11	9	3	289
Inches of earth above the water, year 1888.....	-----	292	298	294	293	293	293	293	290	293	297	294	300	-----
Per cent of cases of typhoid fever reported, year 1888.....	100	5	3	2	3	3	4	7	13	18	23	11	9	609
Per cent of outbreaks which began in each month, 1888.....	100	7	5	3	3	4	6	12	15	16	15	6	7	265

\* The per cent of cases in each month was not computed in 1886.

## TWO LINES OF EVIDENCE OF THE PREVALENCE OF TYPHOID FEVER.

In studying the prevalence of typhoid fever in 1888, from the facts presented in the preceding pages, and from those presented in the following pages, it must be borne in mind that the facts are from two distinct sources of information:

1.—The numbers of outbreaks, of cases of sickness, and of deaths from typhoid fever are taken from special reports from health officers and other township, city and village officers, during the course of an outbreak, at its close, or in special reports at the close of the year. If all the people and officers report as the laws provide, the facts presented should represent the *actual numbers* of outbreaks, cases of sickness, and deaths from typhoid fever. It is just to state that, as the people generally are becoming better instructed in the measures recommended by the State Board of Health for the saving of life and health, better and more complete reports are made year by year. So, each year, we believe that an increasing proportion of the cases of sickness and deaths from the dangerous communicable diseases are reported to this office. This tends towards an apparent increase in the prevalence of the disease each year, modified, of course, by the real fluctuation in prevalence. While waiting for perfect reports, the facts derived from those now received are valuable for purposes of study.

2.—The prevalence of typhoid fever, or of any given disease, as indicated by the "per cent of reports" is taken from the weekly postal-card reports from regular correspondents of the State Board, health officers of cities and villages, and others. The "per cent of reports" is the per cent of the whole number of reports received which stated the presence of the disease named; it gives the relative prevalence of the disease, under the observation of the physicians who report. It may represent the relative area of prevalence of the disease, combined with the relative number of weeks the disease continued where it did occur, *but not the actual number of cases.*

The weekly card-reports, however, furnish a valuable means of ascertaining, approximately, the relative prevalence of the several diseases, and it is as good a scheme for ascertaining the facts as is yet available.

A comparison of the evidence from the two sources, just mentioned, relative to typhoid fever during the years 1886, 7 and 8, is facilitated by the following exhibit:—

EXHIBIT 1.—*By years for the Four Years 1885-1888, the Per cent of Reports (from regular correspondents to the State Board of Health, and others) Stating the Presence of Typhoid fever in Michigan, also the numbers of Outbreaks, numbers of Localities of Outbreaks, the Cases of Sickness and the Deaths from Typhoid fever for the Same Years.*

YEARS.	Per cent of Weekly postal Reports Stating the Presence of Typhoid fever.	Reported Outbreaks of Typhoid fever.	Reported Localities of Outbreaks of Typhoid fever.	Reported Cases of Sickness from Typhoid fever.	Reported Deaths from Typhoid fever.
1885.....	8	218	200	715	194
1886.....	8	290	282	1,194	282
1887.....	10	335	320	2,424	411
1888.....	10	316	296	*1,511	310

\*Inasmuch as it appears that the reported outbreaks and localities in which typhoid fever occurred in 1888 were not very much less than in the preceding year, and were even more than in the year 1886, it is possible that in 1888, the outbreaks of typhoid fever were not allowed to spread as much as in previous years.

THE RELATION OF SICKNESS FROM TYPHOID FEVER TO THE RAINFALL, TO  
THE GROUND WATER,\* AND TO THE HEIGHT OF THE  
WATER IN WELLS, IN MICHIGAN.

Typhoid fever probably differs in its mode of spread from the other dangerous communicable diseases. It is now most generally believed to be spread by a specific "germ," which is reproduced in the intestines, being conveyed from the bowel discharges of a victim of the disease to the alimentary canal of the second victim. Probably the most usual mode of conveyance for these "germs" is the contamination of the water-supplies by the fecal matter from those sick with this disease. The contamination of the water-supplies and the virulence of the infected water seem to depend largely on the amount of rainfall and the consequent amount of water in wells which supply water for culinary and drinking purposes. A discussion of this subject from the evidence then collected, was printed in the Report of this Board for the year 1884, pages 88-114. Further evidence has been collected and is presented in the following tables and diagrams.

TABLE 6.—TYPHOID FEVER IN MICHIGAN.—*Average per cent of weekly card-reports stating the presence of Typhoid Fever, by Year and Months for the Ten Years, 1878-87, also in each of the years 1885, 1886, 1887, and 1888.*

Period of Time.	Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 yrs. 1878-87†	12	10	9	7	5	5	5	7	14	20	22	20	14
1885.....	‡ 8	11	7	5	4	3	5	5	6	11	13	16	8
1886.....	‡ 8	6	3	4	3	5	4	5	13	16	16	13	10
1887†.....	10	6	10	4	3	3	4	8	14	22	18	15	11
1888.....	10	10	7	6	5	4	5	7	12	18	16	12	10

Table 6 exhibits the average prevalence of typhoid fever in Michigan by year and months for the ten years 1878-87, and for each year 1885-88, as indicated by the weekly card reports made by regular observers. Table 7 exhibits the rainfall by months and year for the period of ten years, 1878-87, and for each year, 1885-88.

\* It now appears that the fluctuations in the level of the water in the wells from which water is drawn daily are not the same as in wells from which no water is drawn, and which, therefore, would show more accurately the level of the ground water.

† The figures in the line for 1887, and in the line for the average for the ten years 1878-87, in this table do not all exactly agree with those in the same lines in the table printed on page lvi. of the Report of this Board for the year 1888, for the reason that the table printed in the Report for 1888 was made before the cards were all compiled for the year and was taken from the compilation (of the card-reports first received) for the quarterly reports. The line, "Average 10 years 1878-87," included the data for the year 1887 and consequently is not exactly, although it is substantially, the same as in the above table.

‡ Since May, 1885, physicians have reported only the prevalence of diseases under their own observation. Previous to that time diseases which were believed to be present (under the care of other physicians) were so reported. This may account for a part of the sudden decrease in 1885 and 1886 as compared with the preceding years.



TABLE 7.—RAINFALL IN MICHIGAN.—Average number of Inches, by Months, for the Ten Years 1878-87, also in 1885, 1886, 1887, and 1888.

Period of Time.	Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 yrs., 1878-87...	37.27	2.09	2.89	2.28	2.49	3.52	4.24	3.44	3.21	3.72	3.45	2.98	2.69
1885.....	35.82	2.70	.73	.53	2.47	2.30	6.01	2.52	5.82	3.75	3.08	2.90	2.14
1886.....	32.16	3.05	1.72	2.74	2.40	2.58	2.29	1.36	4.21	5.36	1.97	2.35	2.13
1887.....	29.82	2.27	4.47	1.18	1.54	2.25	2.76	2.46	1.98	2.81	2.48	2.10	2.55
1888.....	29.55	1.99	1.77	2.51	2.15	3.73	2.87	2.02	2.38	2.66	2.68	2.92	1.89

Table 8 exhibits the relation of low water in wells to sickness (as shown by the weekly card reports) and the reported deaths from typhoid fever in Michigan, for the ten years, 1878, 1880-88. The facts presented in two lines of this table, low water in wells and sickness from typhoid fever, are graphically represented in the diagram on page 256.

TABLE 8.—Exhibiting, for Michigan, by Months, during the Ten Years, 1878, 1880-1888\*, the Relation of Low Water in Wells, to Sickness from Typhoid Fever; also, the Reported Number of Deaths from Typhoid Fever.

Month.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. inches of ground above the water in wells†.....	185	179	175	167	167	171	189	195	202	209	202	199
Av. Fluctuation from Max. Depth of water in wells.....	18	12	8	0	0	4	22	28	35	42	35	32
Sickness from Typhoid fever‡.....	11	9	7	5	5	6	7	13	20	21	19	14
Av. number of reported    deaths from Typhoid fever.....	24	21	25	25	24	20	28	59	93	99	71	54

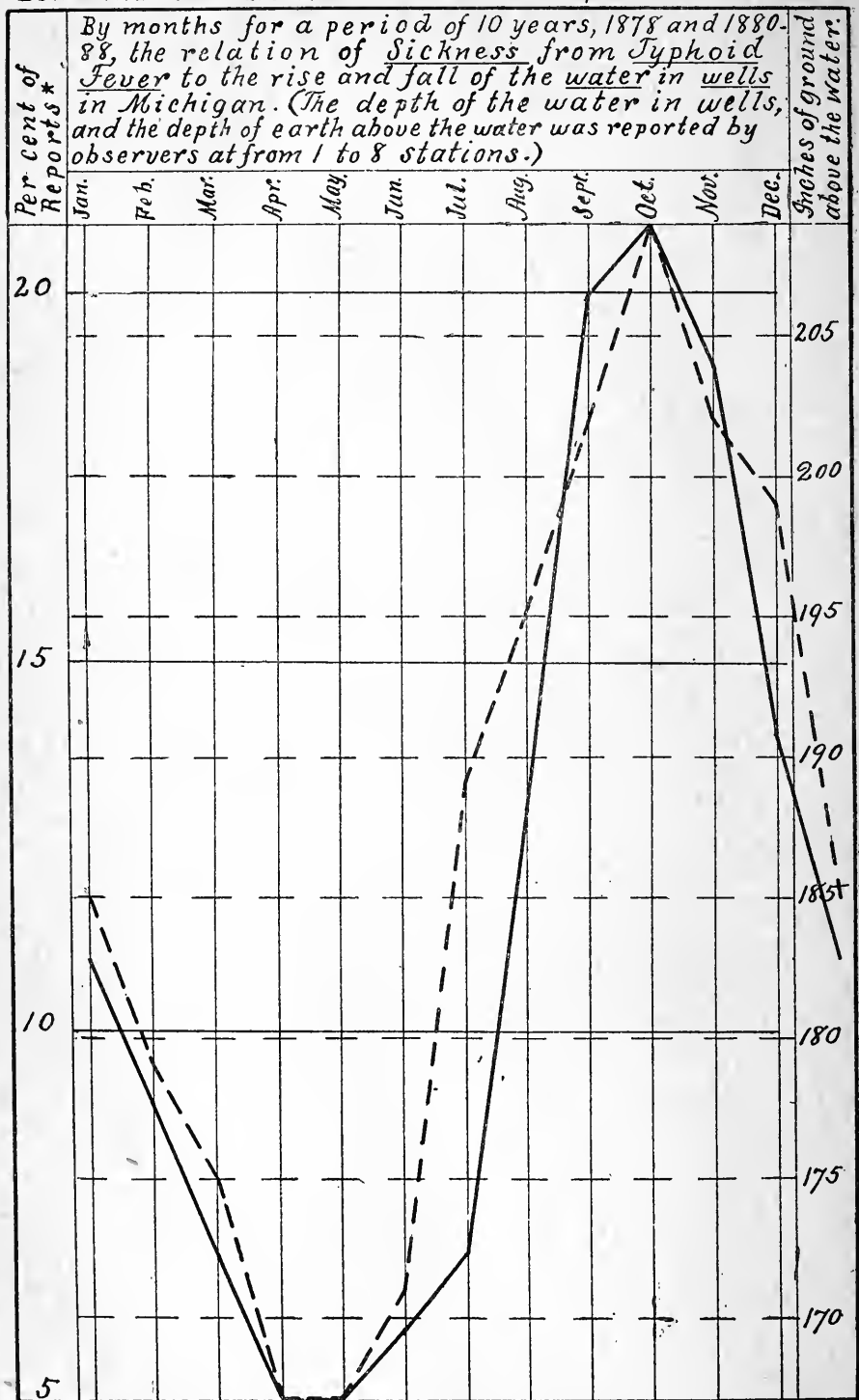
\*The data relating to the sickness and the deaths from typhoid fever in the years 1878, 1880-88, were used in order to coincide with the same period for which the measurements of ground above the water in wells were already obtained.

†The year 1879 could not be included as, for that year, there was no station from which reports were received for the whole year. The stations used in the compilation of this line, and the years for which reports were received and compiled from each are as follows: Elsie, 1878; Thornville, 1880-1 and 1885-7; Hillsdale, 1880, 1884, 1887 and 1888; Mendon and Union City, 1880; Linden and Dearborn, 1881; Brockway Center, 1882 and 1883; Otisville and Woodland, 1882; Saginaw City, 1883; Kalamazoo, 1884 and 1889; Lansing, S. B. of H., 1885-88; Ann Arbor and River Raisin, 1886-88; Alpena, 1887-88; Otsego, 1887; Traverse City and Battle Creek, 1888.

‡Per cent of weekly reports, from observers in different parts of the State, which stated the presence of typhoid fever.

||The data used in the compilation of this line were taken from the Registration Reports of Michigan.—Vital Statistics.

# LOW WATER IN WELLS AND SICKNESS FROM TYPHOID FEVER IN MICH.



Sickness —————. Ground Water — — — — —.

\* Which stated the presence of Typhoid Fever.

NOTE.—The danger from typhoid fever appears to be greatest in October, when the water in wells is lowest, that is, when there are the most "Inches of earth above the ground-water." The danger is least in May, when the ground-water in wells is highest.

From January to June the curves representing sickness from typhoid fever and low water in wells are nearly coincident, but from June to August the curve for sickness follows the curve for low water in wells with an interval of about a month, thence to the close of the year the agreement is very close.

The stations at which the measurements of water in wells are taken and the number of years which are available from each station are stated in the dagger (†) footnote at the bottom of Table 8 page 255. The Office has been unable thus far to get accurate measurements of the height of water in wells for a long period of years from any stations in Michigan. This absence of extensive data is especially deplored when a comparison of one year with a series of years is desired, but in the averages for a series of years by *months*, the evidence is accurate and valuable.

It is believed that all the wells from which measurements of water are made for this Office, except the well at Lansing, are used. The well at Lansing is in the capitol grounds, far enough from other wells so as not to be liable to be affected by the rise and fall of the water in other wells from daily use, and so would more nearly represent the gradual rise and fall of the *ground water* than would measurements in wells from which water is drawn.

TABLE 9.—GROUND WATER.—*Inches of Earth above the Water—by Months for the four years, 1885-88, and for the last four months of the year 1884, and for each of the four Years, 1885, 1886, 1887, and 1888, at Lansing, Mich.—Well in the Capitol Grounds.*

PERIOD OF TIME.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1885-88. ....	287	288	288	285	282	283	284	287	288	288	291	291	292
1884. ....										290	291	293	292
1885. ....	284	288	289	292	280	281	279	282	283	282	285	281	280
1886. ....	281	276	278	274	272	273	277	282	287	287	286	291	294
1887. ....	290	296	287	280	282	285	288	290	291	291	294	297	294
1888. ....	294	292	298	294	293	293	293	293	290	293	297	294	300

Table 9 exhibits the height of ground above the water in the well at Lansing, by months and year for the four years 1885-88. In table 11, the first line of the above table is used, with the average line in the following table (10), together with the average sickness from typhoid fever during the same years.

TABLE 10.—*Temperature of the Water in the Well at the State Capitol in Lansing, Mich., by Months for the Four Years, 1885-88, and the last four months of the year 1884.*

YEAR AND PERIOD OF YEARS.	Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. Four Y'rs, 1885-88.	48	50	46	45	45	47	48	48	50	51	51	52	49
1884.....										50	51	51	49
1885.....	47	49	47	43	42	45	48	47	48	50	50	51	45
1886.....	48	49	47	46	45	46	46	47	50	52	52	51	50
1887.....	48	50	41	42	46	47	48	49	51	50	51	52	51
1888.....	49	50	49	48	47	48	48	47	50	51	51	52	51

TABLE 11.—*Sickness from Typhoid Fever in Michigan (as indicated by the Weekly Card Reports by all Observers) and the depth of Earth (in inches) above the Water in the Well, and the temperature of the water in the Well, at Lansing, Michigan, by Year and Months for the Four Years 1885-88.*

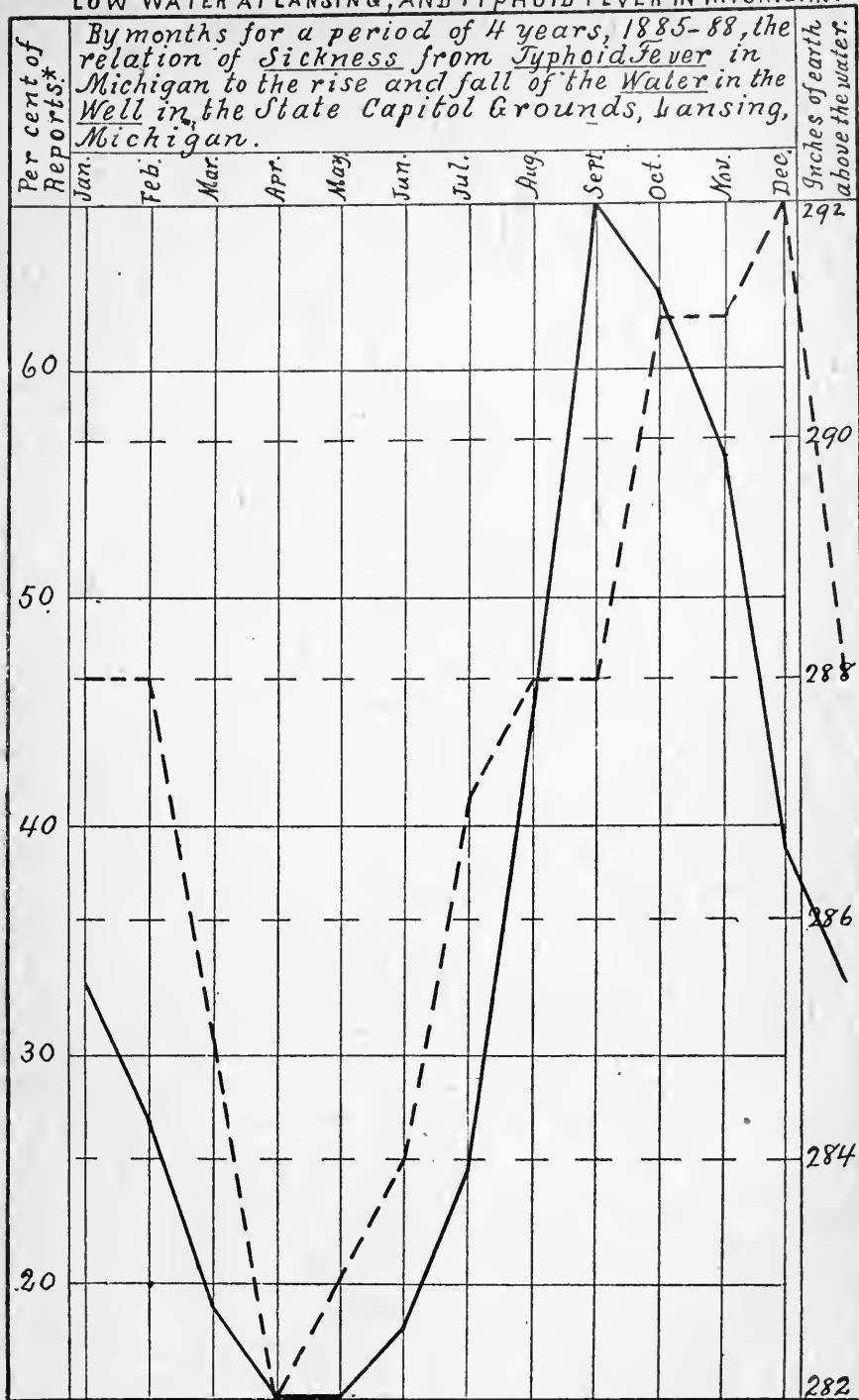
	Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Sickness from Typhoid Fever*....	9	8	7	5	4	4	5	6	11	17	16	14	10
Inches of Earth above Water in Well.....	287	288	288	285	282	283	284	287	283	288	291	291	292
Temperature of Water in Well..	48	50	46	45	45	47	48	48	50	51	51	52	49

\* Per cent of all reports received (from observers in different parts of the State) which stated the presence of typhoid fever.

The relation which the sickness sustains to the ground water is shown in the diagram on page 259. In that diagram the curve for ground water in December would be lower (289 instead of 292) if the observation for December, 1888, were excluded; and any typhoid fever due to low water in December, 1888, would be in the year 1889, therefore it would not appear in this diagram. In 1888 there was an unusual amount of typhoid fever in Lansing. It is regretted that the curve representing typhoid fever cannot be given for Lansing alone. On the whole, however, the two curves in this diagram bear as much resemblance to each other as could be expected; but not as much as do the curves in the diagram on page 256, in which the wells at other places than Lansing are shown.

It has been quite difficult to obtain records of the accurate measurements of water in wells, and it is hoped that persons in different parts of the State will soon see the importance of supplying such information, and will contribute it for the use of those who are studying the causation of diseases. Examination of the diagram on page 256 should convince any person that there must be some necessary relation between the well-water and the sickness from typhoid fever in Michigan.

# LOW WATER AT LANSING, AND TYPHOID FEVER IN MICHIGAN.



Sickness —————

Ground Water — — — — —

\*Which stated the presence of Typhoid Fever.

TABLE 12.—*Exhibiting the Average Total Annual Rainfall at Stations in Michigan, the same for Lansing, the inches of Earth above the Ground Water at Lansing, the Inches of Water in an undisturbed Well at Lansing, and the Reported Sickness from Typhoid Fever in Michigan, as indicated by the per cent of all the weekly card-reports which stated the presence of Typhoid Fever.*

YEAR, AND PERIOD OF YEARS.	Av. Total Annual Rain- fall at Stations in Michigan, in inches.	Total Annual Rainfall at Lansing, in inches.	Inches of Earth above the Ground Water at Lansing.	Inches of Water in an Unused Well at Lansing.	Ground Water, higher (+) or lower (-) than the four years' average, in inches.	Av. Per Cent of all Weekly Card Reports Stating the presence of Typhoid Fever.	More (+) or less (-) Sickness from Typhoid fever than the four years' average.
Av. 4 Y'rs, 1885-88.	31.84	29.97	287	37	=	9	=
1885.....	35.82	34.51	284	40	+3	8	-1
1886.....	32.16	29.52	281	42	+5	8	-1
1887.....	29.82	30.08	290	34	-3	10	+1
1888.....	29.55	25.76	294	29	-8	10	+1

Table 12 is a summary of the facts presented in tables 6 and 7, with the addition of the facts relative to the height of the water in the well at Lansing.

For the year 1888, the prevalence of typhoid fever so far as can be judged by the evidence of the weekly-card reports, was about the same as for the preceding year, 1887, but greater than for either of the years 1885 or 1886. The rainfall for the State during the year 1888, was about the same as for the preceding year, 1887, but less than for either of the two years 1885 or 1886. The rainfall at Lansing during the year 1888 was less than for 1887 or either of the two years, 1885 and 1886. The height of the ground water (as indicated by the depth of earth above the water in the well) at Lansing was correspondingly low for the year 1888, when it was lower than in any one of the three years 1885-87.

The diagram on page 256 exhibits the rise and fall of the water in wells from which water is drawn for use; and the diagram on page 259 exhibits the rise and fall of the water in a well from which no water is drawn for use, namely, the well at Lansing. By comparing these diagrams, it will be seen that the rise and fall of the water in wells from which water is drawn for use, conforms more closely to the rise and fall of typhoid fever than does the rise and fall of ground water, as evidenced by observations of a well from which water is not drawn. It appears that, if the station at Lansing were omitted in constructing the curve in the diagram on page 256, this curve would conform even more closely to the curve of sickness than it does. The data for the curve for the rise and fall of water in wells from which water is drawn for use, are taken from measurements of from one to eight wells per year, while the curve for the rise and fall of ground water is taken from the measurements of but one well, viz.: the well in the capitol grounds at Lansing. There might be a closer relation of this curve to the curve of sickness if more wells were averaged, but this is the only one from which water is not drawn for use for which we have records of observations.

TABLE 13.—*Height of Ground (in Inches) above the Water in the Well at Thornville, Michigan, by Months for the Eight Years 1880-87. (Observations made by John S. Caulkins, M. D., near the middle of each month.)*

Months and Year.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 8 yrs. 1880-87....	204	209	207	204	199	199	199	202	205	206	207	208	208
1880.....	212	216*	216	225	214	212	210	208	208	206	211	209	209
1881.....	207	215	211	204	198	198	200	204*	210	213	213	210	211
1882.....	199	210	210	203	198	196	192	195	198	198	195	198	198
1883.....	199	202	202	202	198	198	197	195	195	199	201	202	202
1884.....	200	193	203	196	195	194	198	201	202	205	205	206*	206*
1885.....	200	210	210	200	192	194*	198	202	200	195	197	200	200
1886.....	202	201	197	196	192	189	191	193	209	209	211	214	216
1887.....	215	222	209	206	206	212	208	218	217	221	221	221	220

\* Interpolated by Dr. Henry B. Baker.

Table 13 exhibits by months and year for the eight years 1880-87, the height of ground above the water in the well at Thornville,—a used well. The following table (14), exhibits the temperature of the water in the same well for the same years.

TABLE 14.—*Temperature of the Water in the Well at Thornville, Michigan, by months for the Eight Years, 1880-87. (Observations by John S. Caulkins, M. D., near the middle of each month.)*

Year and Period of Years.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 8 yrs. 1880-87....	45	39	40	40	43	46	47	48	49	50	48	45	41
1880.....	45	40	40	42	42	48	47	48	48	50	47	42	42
1881.....	45	40	41	42	42	45	46	47*	48	50	49	42	43
1882.....	47	43	49	42	44	45	47	48	51	50	49	48	42
1883.....	44	40	38	38	44	44	47	48	49	49	48	44	40
1884.....	44	37	38	42	42	44	48	46	49	50	48	45*	41*
1885.....	44	37*	36	36	45	46*	48	48	48	49	46	46	41
1886.....	44	26	38	36	43	45	47	49	50	50	48	46	40
1887.....	46	36	42	41	45	47	49	50	52	52	49	46	40

\* Interpolated by Dr. Henry B. Baker.

The average lines in tables 13 and 14 are used in the following table (15) with the average per cent of reports stating the presence of typhoid fever for the same years. (There is no diagram exhibiting the facts presented in this table.)

TABLE 15.—*Sickness from Typhoid Fever in Michigan, as Indicated by the Weekly Card Reports by all Observers, and the Depth of Earth above the Water in the Well and the Temperature of the Water in the Well at Thornville, Michigan, by Year and Months for the Eight Years, 1880-87. (Measurements of earth and observations of temperature were made at Thornville, near the middle of each month, by John S. Caulkins, M. D.)*

	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Sickness from Typhoid fever...	12	11	9	7	5	5	6	8	14	21	22	20	14
Inches of Earth above Water in Well.....	204	209	207	204	199	199	199	202	205	206	207	208	208
Temperature of Water in Well..	45	39	40	40	43	46	47	48	49	50	48	45	41

Table 16 is similar to Table 12 on page 260, except that the data for the height of earth above the water in the well and the depth of the water in the well are taken from measurements at Thornville, Mich., whereas in Table 12 they were from measurements at Lansing. It is for a longer period of time than is Table 12.

TABLE 16.—*Exhibiting the Average Total Annual Rainfall at Several Stations in Michigan, the same for Thornville, the Inches of Earth above the Water in a Well at Thornville, the Inches of Water in the same Well at Thornville, and the Reported Sickness from Typhoid Fever in Michigan, as indicated by the per cent of all the Weekly Card Reports which stated the presence of Typhoid Fever.*

Year, and Period of Years.	Average Total Annual Rainfall at Stations in Michigan, in Inches.	Total Annual Rainfall at Thornville, in Inches.	Inches of earth above the Water in the Well at Thornville.	Inches of Water in the Well at Thornville.	Well-water higher (+), or lower (—) than the eight-year average in Inches.	Average per cent of all Weekly Card Reports which stated the Presence of Typhoid Fever
Av. 8 years, 1880-87.....	37.29	34.86	204	36	.....	12
1880.....	42.12	39.00	212	28	—8	14
1881.....	43.20	29.58	207	33	—3	18
1882.....	37.25	33.57	199	41	+5	14
1883.....	40.91	40.83	199	41	+5	11
1884.....	37.02	36.37	200	40	+4	12
1885.....	35.82	37.12	200	40	+4	*8
1886.....	32.16	30.76	202	38	+2	*8
1887.....	29.82	31.66	215	25	—11	10

\* Since May, 1885, physicians have reported only the prevalence of diseases under their own observation. Previous to that time diseases which were believed to be present (under the care of other physicians) were so reported. This may account for a part of the sudden decrease in 1885 and 1886 as compared with the preceding years.



## TRANSMISSION OF TYPHOID FEVER THROUGH THE AIR.

The most general mode of spreading typhoid fever is probably by the contamination of the water supply, from wells, etc., by the leaching from privies, drains, etc., of discharges from typhoid fever patients, the specific "germs" being reproduced in the intestine of the patient. But there are instances in which the disease seems to be spread through the air. The conditions under which this occurs are not well known. It has been believed that this probably occurred through the drying of the fecal discharges, and the "germs" therefrom being inhaled with the dust of the air. Experiments on this subject are needed to demonstrate the exact conditions.

It is reported\* that Dr. Bordas "has instituted experiments to determine the relation between the humidity of the atmosphere and the transmission of the typhic bacillus. A current of dry air, completely devoid of germs, was conducted through a vessel containing a beef-broth culture of the typhic bacillus and into a second vessel containing sterilized beef-broth. The second vessel remained sterile. The result was the same when a dry atmospheric current was passed over pumice stone saturated with a culture of typhic bacillus. When moist air was passed through the same vessel a very different result was obtained. The sterile beef-broth culture was found, after the lapse of a quarter of an hour, to be thickly planted with the typhic bacillus.

"In nature this state of humidity is supplied by mist or fog, and statistics show an increase of typhoid fever in Paris during the months of October, November, December, and January."†

From the details of the experiments mentioned above, it is difficult to understand how air passed through a solution, or through a vessel containing a solution, should remain dry, however dry it may have been before entering the solution or the vessel containing the solution. But it is possible that some detail of the experiment may not have been stated.

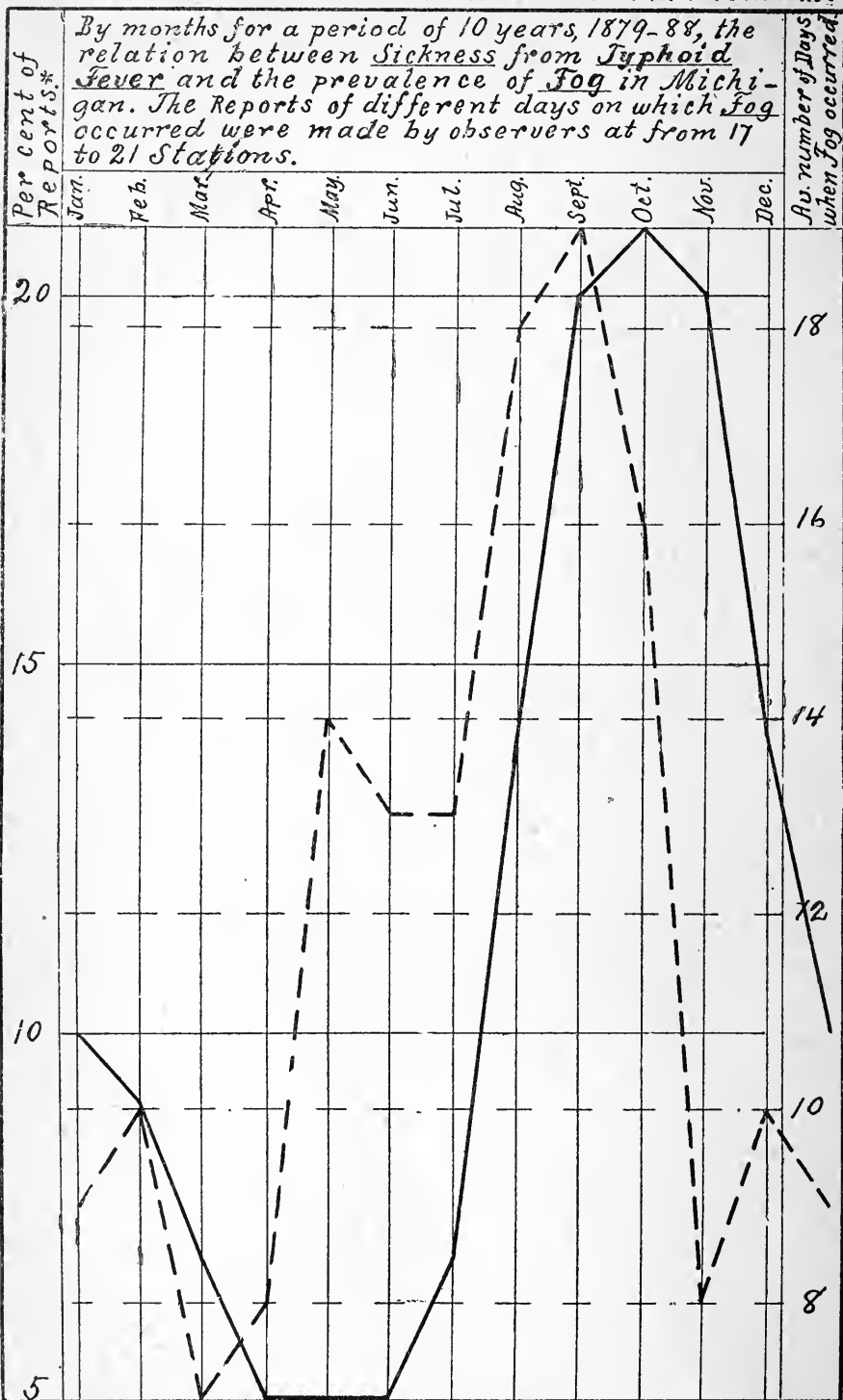
As a contribution to the study of this subject there is here given (page 265) a table exhibiting the relation of sickness from typhoid fever to the presence of fogs in Michigan. The table includes the recorded experience in Michigan for a series of ten years, and is valuable in that it shows just what the average relations are in Michigan, in each month of the year. The facts in the table are graphically exhibited in the diagram (page 264). It will be seen that, as a rule, the sickness from typhoid fever rises and falls following, with some regularity, the rise and fall of fogs.

But that the relation of typhoid fever to fogs is not so close as it is to the fluctuations in the level of the water in wells is shown by comparing the diagram mentioned above with the diagram "Low Water in Wells and Sickness from Typhoid Fever in Mich." printed on page 256.

\* *La Revue Médico Pharmaceutique*, Constantinople, May 31, 1890, translated in *The Abstract of Sanitary Reports*, U. S. Marine-Hospital Bureau, July 11, 1890.

† *La Revue Médico Pharmaceutique*, Constantinople, May 31, 1890, translated in *The Abstract of Sanitary Reports*, U. S. Marine-Hospital Bureau, July 11, 1890.

# FOG AND SICKNESS FROM TYPHOID FEVER IN MICHIGAN.



• Sickness ————— Fog - - - - -

\* which stated the presence of Typhoid Fever.

TABLE 17.—*Exhibiting, by months, for the ten years, 1879-88, the average per cent of weekly reports which stated the presence of sickness from Typhoid Fever in Michigan, also the average number of different days on which Fogs\* occurred.*

Ten Years, 1879-88.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average per cent of reports of sickness.....	10	9	7	5	5	5	7	14	20	21	20	14
Average number of days on which Fog occurred.	9	10	7	8	14	13	13	18	19	16	8	10

\* Fogs were reported by observers at from 17 to 21 Stations in different parts of the State.

### MEASLES IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1888.

During the year ending December 31, 1888, there were reported to the office of the Secretary of the Michigan State Board of Health, 10,558 cases of sickness and 170 deaths from measles. These reports are for 329 local jurisdictions, showing an average of 32 cases per locality (township, city or village, as the case may be). There was one death to every 62 cases reported.

Of the source of contagium for the outbreaks of this disease, the health officers report in 144 instances that it was from a former case, 63 reported that they are unable to state how the disease originated, and 125 say nothing about the source.

Of the efforts made to restrict the disease, but little is said in the reports. Some state that they let it "take its course," and a few seem to have made some feeble efforts at restriction, but generally nothing very effective was done.

TABLE 1.—*Measles in Michigan during the year 1888, exhibiting by months, the per cent of all weekly card-reports received which stated the presence of measles; the average per cent of all observers reporting weekly who reported measles; the average order of prevalence of measles where it was present; and the number of outbreaks reported by health officers and clerks of local boards of health.*

1888.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Per cent of weekly card reports....	16	16	25	28	35	37	30	10	3	3	4	2	3
Average per cent. of observers.....	25	31	33	44	50	57	44	18	9	8	10	6	4
Average order of prevalence where present.....	3.2	3.5	3.4	3.1	2.7	2.4	2.9	3.5	4.8	4.6	5.0	6.7	4.0
* Outbreaks.....	* 332	42	20	53	66	46	25	7	7	6	6	2	5

\* Forty-seven outbreaks were reported without dates, and are omitted in this statement of the number of outbreaks per month.

NOTE.—The facts in this table are from two distinct sources,—the first three lines contain statements derived from the weekly postal-card reports by physicians, the last line contains statements derived from official reports by health officers and clerks of local boards of health.

The above table exhibits the evidence of the weekly card-reports and of the special reports by health officers and clerks of local boards of health concerning the prevalence of measles during the year 1888, from which it may be learned that the disease was quite prevalent during the first part of the year, and that the greatest prevalence was in May. Beginning with July there was a rapid decline of the disease to the end of the year.

In the Annual Report of this Board for the year 1888, pages 264-267, a study of periodicity in the prevalence of measles was printed. In that article it was shown that measles exhibits a seven-year period in its prevalence and it was predicted that a maximum period would be reached in the year 1888. A diagram has been prepared which graphically illustrates the facts then presented, and continues the curves to the year 1888, confirming the statements in that article so far as relates to this year.

#### AGE OF PERSONS SICK WITH MEASLES.

Of the 2,484 cases of measles considered in the following table (and these were all of which the age of the patient was stated), 1,303 occurred before the tenth birthday was reached. In the first period (those under ten years of age) the deaths were 2.6 per cent of the cases, which is 0.7 per cent above the average for all ages. In the cases among persons from ten to twenty years of age the per cent of deaths was lowest, being 1.1 below the average. In those from forty to fifty years of age, the number of deaths is greatest, being 7.1 per cent of the cases, or 5.2 per cent above the average. Thus it will be seen, that of these divisions the least fatal age for measles is between ten and twenty years, and the greatest danger is after forty years of age.

Nineteen cases were reported as having occurred, during the year 1888, in persons after the forty-fifth birthday, with no deaths. There occurring no deaths in this number of cases at that age is probably an exception to the rule, and would not hold good in a very large number of cases at that age.

TABLE 2.—*Exhibiting, relative to 2,484 (all in which the ages were reported) cases of Measles in Michigan in 1888, the number of Cases, and Deaths, and the Per Cent which the Deaths were of the Cases in several periods of ages.*

	Reported Cases and Deaths within Certain Ages.						
	All Ages.	Under 10 yrs.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 and over.
Number of Cases.....	2,484	1,303	842	216	86	28	9
Number of Deaths.....	48	31	7	3	2	2	0
Per Cent the Deaths were of the Cases.....	*1.9	2.6	0.8	1.4	2.3	7.1	0

\*The per cent which the deaths are of the cases, as here given, relates only to those cases for which the age of the patient was stated in the report.

The following table exhibits the number of cases occurring in each of the first five years of age of the patient, and in each five-year period up to seventy-five years of age; also the average age for each period, and for all the periods, and the per cent of the whole number occurring in each five-year period.

In this table it may be seen that the greatest number of cases occurred between the fifth and tenth birthdays, and that less than one per cent occurred after the forty-fifth birthday.

TABLE 3.—Exhibiting the number of Cases of Measles occurring at stated ages and periods of age, together with the average age for each period and the per cent of cases in each period to the total number of cases. (Compiled from those reports in which the age was stated,—not all reports did so.)

	All Cases.	Number, Average Age, and per cent of Cases in persons within certain periods of Age.															
		Under 1 Year.		1 to 2.	2 to 3.	3 to 4.	4 to 5.	1 to 5.	5 to 10.	10 to 15.	15 to 20.	20 to 25.	25 to 30.	30 to 35.	35 to 40.	40 to 45.	45 to 50.
		1 to 2.	2 to 3.	3 to 4.	4 to 5.	5 to 10.	10 to 15.	15 to 20.	20 to 25.	25 to 30.	30 to 35.	35 to 40.	40 to 45.	45 to 50.	50 to 55.	55 to 60.	60 to 65.
Number of Cases.....	2,484	41	93	127	125	140	528	775	551	291	132	64	58	28	18	3	2
Average Age*.....	11.6	0.5	1.5	2.5	3.5	4.5	2.9	7.4	12.3	17.3	21.9	27.5	31.7	36.4	41.7	51.5	57.5
Per cent of all cases in each period of Age....	100	.....	.....	.....	.....	.....	21	31	22	12	6	3	2	1	1	0.8 of one per cent.	.....

\* As the age, as a rule, was reported in years at last birthday only, six months have been added to the age of each individual to approximate the average age.

## AGES OF PERSONS WHO DIED OF MEASLES IN THE YEAR 1888.

Of the 170 deaths reported to have occurred from measles during the year, the ages of but 48 were stated. The following table exhibits the number of deaths which occurred in each of the first five years of age, and in periods of five years each after the fifth birthday. It will be noted that a greater number of deaths occurred during the second year of age, than in any other year or period of years, except the first which included that age, and that over one-half of all the deaths were of persons under five years of age, and that the average age of those who died was 9.2 years.

TABLE 4.—*Exhibiting the number of Deaths from Measles occurring at stated ages, and periods of ages together with the average age for each period and the per cent the deaths in each period were of the total number of deaths reported. Compiled from reports in which the age was stated.*

	All deaths.	Age—in Periods of Years.													
		Un- der 1 Yr.	1 to 2.	2 to 3.	3 to 4.	4 to 5.	Un- der 5.	5 to 10.	10 to 15.	15 to 20.	20 to 25.	25 to 30.	30 to 35.	35 to 40.	40 to 45.
Number of deaths.....	48	7	12	2	3	1	25	9	2	5	2	1	2	0	2
Average age * at death.	9.2	0.5	1.5	2.5	3.5	4.5	1.7	7.1	13.5	17.9	23.5	29.5	31.5	0	41.0
Per cent of deaths in each period.....	100	-----					52	19	4	10	4	2	4	0	4

\* As the age was reported in years at last birthday. Six months have been added to each age to approximate the average age at death.

TABLE 5.—*Exhibiting the Average Per Cent of Reports, and of Observers and the Average Order of Prevalence of Sickness from Measles in Michigan per month, and also the Deaths, during the 12 years and each of the 12 years 1877-1888.*

YEARS.	Annual Average 12 yrs.	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888
Average Per Cent of Reports* .....	13	7	5	12	19	26	11	24	10	5	6	14	16
Average Per Cent of Observers*...	20	12	7	18	30	37	20	37	17	9	10	22	25
Average Order of Prevalence*...	4.7	5.0	5.3	4.7	4.8	4.4	4.9	3.7	5.2	6.4	5.0	3.6	3.2
Deaths from Measles†.....	170	62	16	167	125	256	150	258	144	38	129	285	414

\* The information on this line is obtained from the weekly postal-card reports to the State Board of Health by physicians in different parts of the State.

† According to the Vital Statistics of Michigan.

## WHOOPING-COUGH IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1888.

During the year ending December 31, 1888, there were reported to the office of the Secretary of the State Board of Health, 2,502 cases of sickness and 49 deaths from whooping-cough. These reports represent 161 localities, and show an increase of 235 cases, and a decrease of 10 deaths as compared with the reports for 1887.

In 42 outbreaks the source of contagium was a former case, and its communication was direct. Forty-six health officers report that the source of the contagium was unknown; and 73 did not report on this question. In most localities, there seems to have been little or no effort made to restrict the disease.

The relative importance of Whooping-cough and Small-pox in Michigan in 1888 may be seen by comparing the first and fourth paragraphs on this page.

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## SMALL-POX IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1888.

During the year ending December 31, 1888, there were reported to the office of the Michigan State Board of Health, 60\* cases of sickness from small-pox, and 7 deaths. There were 12\* outbreaks in 11 localities, and in 10 counties, as follows: Cheboygan, 7 cases, 3 deaths; Ingham, 4 cases, 1 death; Lenawee, 1 case, 1 death; Livingston, 13 cases, 1 death; Marquette, 2 cases, no deaths; Monroe, 19 cases, 1 death; Saginaw, 1 case, no death; Shiawassee, 1 case, no death; St. Clair, 1 case, no death; and Wayne, 11 cases, no death.

### SMALL-POX OUTBREAK AT CHEBOYGAN, CHEBOYGAN COUNTY, DECEMBER 18.

With reference to this outbreak the local health officer reports:—

"It was introduced in this village by a man who contracted it at Seattle, Washington Territory. He came into this town on Monday last. He was sick all his way along. His friends were admitted in his room till yesterday morning (Friday) when small-pox was recognized by his physician."

Small-pox was present at Seattle at the time of the departure of this patient from that place. He was sick during his entire journey, yet the disease was not recognized as small-pox until the fifth day after his arrival, and after having exposed many persons to the disease. During this outbreak there occurred 7 cases and 3 deaths.

### SMALL-POX OUTBREAK AT LANSING, NOVEMBER 23, 1888.

The health officer of the city of Lansing reports the source of contagium for this outbreak as "through James Rowe coming from Sarnia, Canada."

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\* In the compilation of this article, all outbreaks of small-pox which began in the year 1888 are considered, but only the number of cases and deaths occurring before the end of the year are given in the table on page 273. All special correspondence relating to the outbreaks is considered, without regard to the time when the outbreak closed. Accounts of outbreaks which began after December 31, 1888, will appear in the next Annual Report from this office.

' This outbreak continued into 1889, and closed February 20, with a total of 11 cases and 2 deaths. Several persons had been exposed to the first case before the nature of the disease had been ascertained, and it was reported that the nurses left their patient for a short time occasionally during the night time and wandered about the back streets, thus exposing several people, one, at least, of whom was taken with the disease and died. Free vaccination was offered by the city, and over 3,000 persons were vaccinated within a few days.

#### SMALL-POX OUTBREAK IN DEERFIELD TOWNSHIP, LENAWEE COUNTY.

The first case in this outbreak occurred on December 27, 1888. Of the source of contagium the local health officer says:—

"Early in December Eli Lapointe was unconsciously exposed at a Mr. Ball's, near East Milan, Monroe county, Mich. Coming to his uncle's here he came down with the disease."

This outbreak ended February 20, with a total of 7 cases and 2 deaths. Of one case which occurred in the village of Deerfield, Dr. N. D. Yale, the health officer writes:—

"Mr. McKay believed the disease was brought to him by the physician who attended the cases in the country. It was his custom to come into Mr. McKay's store immediately after visiting his patients, to warm, visit, and smoke. Both used tobacco and matches from the same box, etc. There was no other possible source of contagium suggested."

Of a patient in the country, a Mrs. Malosh, the health officer writes:—

"Mrs. Malosh died in the first outbreak, the next day after giving birth to an apparently healthy babe. When the babe was nine days old it became sick with small-pox."

Of another instance he writes: "I revaccinated wife and son, also nurse who had had small-pox. *Vaccine worked on all.*"

#### SHALL EXPENSES IN RESTRICTING SMALL-POX BE PAID BY THE TOWNSHIP OR THE COUNTY.

In a letter, March 25, 1889, Dr. N. D. Yale, health officer of Deerfield, asks the following questions:—

"Is the expense of quarantining, keeping, fumigating, etc., persons afflicted with small-pox, who are in no sense paupers, that is, persons who, except for the quarantining would be self-supporting, to be borne by the township or county in counties where township system of caring for the poor is in force?

"Is an outbreak of small-pox simply a township affair? Are there State funds which can be drawn upon to assist in smothering out the disease?"

In reply the following was sent:—

"In reply to your letter of March 25, I would say that small-pox is *not* 'a township affair,' but a county affair, as you will see by references to the law which I have marked in the pamphlet on the restriction of small-pox, which I send you by this mail. There are probably not any State funds which can be drawn upon, as you will see from the marked paragraph in the other pamphlet which I send you, giving abstract of proceedings of the Board at its last meeting.

"The law would imply that if the patient himself is able, he is liable. The Supreme Court, however, has decided that the locality is primarily liable, and that it is no excuse, for the locality refusing to pay, that the patient was himself liable."

The following is here inserted as being pertinent to the above. The Secretary of the State Board of Health wrote to the Attorney General as follows:



MICHIGAN STATE BOARD OF HEALTH, }  
 OFFICE OF THE SECRETARY, }  
*Lansing, Michigan, April 6, 1889.*

HON. S. V. R. TROWBRIDGE, *Attorney General, Lansing, Mich.:*

DEAR SIR:—It is provided in § 1647 of Howell's Statutes that expenses incurred by the Board of Health for "nurses and other assistance and necessities" while a person is "sick with the small-pox, or other sickness dangerous to the public health" "shall be at the charge of the person himself, his parents, or other person who may be liable for his support, if able; otherwise at the charge of the county to which he belongs."

In this connection, I would respectfully refer to decisions of the Supreme Court, as follows:—

In 1885 the Supreme Court (Third Michigan Report, page 475) granted a writ of mandamus to compel the Board of Supervisors of Macomb county to pay a claim for care of an indigent person sick with small-pox, which claim had been audited by and was for services ordered by the Board of Health of the village of Mt. Clemens, under this section 1647 of Howell's.

In the 51st Michigan, page 527, it is held that the city is immediately responsible, and that "in providing that what is done shall be at the charge of the individual, it is not intended to exempt the public from immediate liability."

In 58th Michigan, page 454, it is held that the Board of Supervisors must pass such accounts and can be compelled by mandamus to do so, that they cannot refuse on the grounds that the patients were able to pay or that sundry tax payers considered the charges exorbitant.

At the present time there are difficulties in two counties in the collection of accounts, and these difficulties tend to interfere with proper action for the prevention and restriction of disease. Therefore will you have the kindness to give your opinion on the following questions:—

Where the township system of caring for the poor is legally in operation, is it then required that all these expenses shall be paid by the township, notwithstanding section 1647, Howell's Statutes, provides that they shall be paid by the county? Or is that section, which relates to the restriction of dangerous diseases, such an exception as requires that the expenses shall be met by the county, for the reason that the danger threatens the entire county?

Very respectfully,

HENRY B. BAKER, *Secretary.*

STATE OF MICHIGAN, }  
 ATTORNEY GENERAL'S OFFICE, }  
*Ionia, Mich., April 12, 1889.*

"HON. HENRY B. BAKER,

*Secretary State Board of Health, Lansing, Mich.:*

DEAR SIR:—Your favor of the 6th inst., containing inquiry regarding the effects of Section 1647 of Howell's Statutes, in cases where the township system of caring for the poor is legally in operation, came to hand in my absence from home,—hence the delay in answering.

My opinion in the matter is that Chapter 39, which relates to the public health and provides for the payment of expenses of care for persons infected with contagious diseases, is not repealed modified, altered or amended by Chapter 42 of Howell's Statutes, the latter referring to the question of the support of poor persons generally by the public, and not referring to the prevention of spread of dangerous diseases. The particular expense concerning which you inquire should be paid as provided by Section 1647, Chapter 39, Howell's Statutes, viz., by the county.

The 51 Mich. 527, holds the city liable because the common council had agreed to pay and employed the claimant, which is entirely different."

Yours very respectfully,

(Dictated.)

S. V. R. TROWBRIDGE."

#### SMALL-POX OUTBREAK AT HOWELL, LIVINGSTON COUNTY, NOV. 5, 1888.

Of the source of the contagium of this outbreak the health officer, Dr. R. B. Bell, says in his special final report:—

"It was brought here by a resident here who had been to Dakota, the person being taken sick while here. It was the mildest form of varioloid, and the half dozen or so of pimples which appeared were just barely noticed by the patient or the attending physician; was only sick two days, slightly."

The disease was not recognized as varioloid at the time, and the patient returned to Fargo Dakota. Two weeks later, his wife and a nephew were

taken sick with the disease. A great many of the nephew's playmates had been exposed, as the nephew and wife were supposed to have chicken-pox.

As soon as this office learned the true nature of the disease and the history of its introduction, the authorities at Fargo, and the Secretary of the Dakota State Board of health were notified by telegraph.

In some instances the authorities are too eager to declare the epidemic at an end, thus allowing infected persons to mingle with the public. No one who has been exposed to the disease should be allowed to mingle with the public until the extreme limit of the period of incubation has been passed, and then not until his clothing and surroundings have been properly disinfected. The following illustrate this and also the results that may occur where physicians who have charge of small-pox patients neglect to disinfect their persons and clothing upon leaving their patient:

The correspondent wrote, on December 30, 1888, as follows:—

"We have had, in all, four cases of small-pox and five of varioloid. We have had one death. All are now well except one at the hospital, and he is convalescent. Services were held at all the churches here yesterday, and the schools will open Wednesday. We have the disease cornered."

On January 5, another correspondent in the same jurisdiction wrote:—

"We have one new case of varioloid, first recognized last night; several have been exposed to this case."

On January 8, the same person wrote:—

"I have just discovered that our last case of varioloid has probably exposed, indirectly, several people to variola outside of Howell. The facts are as follows: Mrs. H. was taken with varioloid on Thursday, January 3. On or about December 5, one of Mrs. Heath's boys was vaccinated by a physician who was at the same time attending our first case of small-pox. On December 18 or 20 this Heath boy broke out with varioloid at the home of his grandfather at Azalia, Monroe county Mich. He was sent home on the 2d or 3d day of the eruption. On his arrival here his disease was pronounced chicken-pox. Now you will notice that the mother of this boy was taken with varioloid on January 3, 1889, or the fourteenth day after first contact with her boy. \* \* I am informed that the physician who attended first case of small-pox did not, at the time of vaccination of the Heath boy, use the 'utmost antiseptic precaution.' This is evident from the fact that this same physician carried the disease to his own wife, at about the same time that the Heath boy was vaccinated." \*

In connection with the above it may be stated here that the Heath boy carried the disease to another county, where 19 cases and 1 death occurred; and from there the contagium found its way to three other localities (in which the outbreaks occurred after December 31), causing 11 cases and 3 deaths; adding the physician's wife, the Heath boy and his mother, we have 33 cases and 4 deaths, apparently as the result of the physician's reported lack of "utmost antiseptic precautions." \*

Subsequent to the date (December 30) of the letter of the first correspondent, and after they had the "disease cornered," they had four new cases in this outbreak.

The local paper of the village in its issue of December 6, said editorially: "There is no danger whatever in coming to ————."

In its issue of a week later, December 13, it said:—

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\*It seems, however, from the report of Health Officer Dr. Bell, that there was no knowledge of the first case being small-pox or varioloid until two weeks later, when the other cases were taken sick. That is the reason why no precautions were taken.—H. B. B., Sec. S. B. of H.

"If there is any small-pox in ——— village it is confined to the house where it first made its appearance. \* \* The schools will commence Monday. All who wish can come to ——— with perfect safety \* \* ."

The following statement also appeared in the same issue, signed by the health officer and by several other physicians and business men:—

"We, the undersigned, wish to say to the community at large, that there is no danger of any one being exposed or taking the small-pox by coming to ———. There is only one case in ——— and that on a back street. The patient is recovering, and every precaution has been taken to prevent any one being exposed, so no one need feel the least hesitancy in coming to ——— on account of the above disease \* \* ."

The same issue (December 13) contained the following communication from the health officer:—"We breathe easier now that all danger of any further spread of small-pox in ——— is at an end."

Notwithstanding all these published assurances of perfect safety, however, the last case of small-pox in ——— was taken sick twenty-three days later, namely, January 5, 1889. The people of this place are to be congratulated, however, on the fact that the disease was finally "stamped out."

#### OUTBREAK IN MILAN TOWNSHIP, MONROE COUNTY, DECEMBER 25, 1888.

This is the Azalia outbreak, the village, being unincorporated, is part of the jurisdiction of Milan township. The first person sick with small-pox in this outbreak was a Mrs. Ball, grandmother of the Heath boy who came from Howell to visit his grandparents, and went home sick with varioloid. The first three cases, all in the Ball family, are reported to have been called chicken-pox, as usual, and no precautions taken. No placards were displayed until January 9, fifteen days after the first case appeared, and exposures had occurred which developed into cases outside of Milan township.

As only one case in this outbreak occurred in 1888, the full history of the outbreak will appear in the compilation on this subject for the year 1889,—to be published in the Annual Report for 1890.

#### SMALL-POX IN MICHIGAN IN 1888 COMPARED WITH PRECEDING YEARS.

The following table exhibits the number of reported cases, deaths, etc., from small-pox in the State of Michigan for the seven years ending December 31, 1888:

TABLE 1.—*Exhibiting for each of the Seven Years, 1882-8, the numbers of reported Localities, Outbreaks, Cases, Deaths, Average number of Cases per Locality, Average number of Cases per Outbreak, and per cent of Deaths to Cases of Small-pox in Michigan. Compiled in the Office of the Secretary of the State Board of Health, from reports made by local health officers.*

Years.	Localities.	Outbreaks.	Cases.	Deaths.	Average Number of Cases per Locality.	Average Number of Cases per Outbreak.	Per Cent of Deaths to Cases.
1882.....	61	.....	589	159	9.7	.....	27
1883.....	8	.....	29	2	3.6	.....	7
1884.....	5	4	22	3	4.4	5.5	14
1885.....	9	9	27	6	3	3	22
1886.....	4	4	*24	7	6	6	29
1887.....	2	4	† 4	0	2	1	0
1888.....	11	12	60	7	5.5	5	12

\* Includes two cases varioloid.

† Includes one case varioloid.

## SOURCE OF CONTAGIUM OF SMALL-POX.

Summing up the reports of health officers in relation to the source of contagium for each outbreak, we find that three report the contagium to have been brought from Sarnia, Canada; two trace the source to the village of Howell; one to Milan township, Monroe county; one to Seattle, Washington Territory; one to Dakota; one "supposed to have been on railroad car;" and, three did not respond relative to the source of contagium.

## PERIOD OF INCUBATION OF SMALL-POX.

Of the reports received which stated the period of incubation, one states it as "from 6 to 14 days;" one "from 10 to 12 days;" and one "14 days."

## PREVENTION OF THE INTRODUCTION AND SPREAD OF SMALL-POX.

The following communication was sent to Hon. Cyrus G. Luce, Governor of Michigan, relative to quarantining against the introduction of small-pox into this State, from Canada:

MICHIGAN STATE BOARD OF HEALTH, }  
OFFICE OF THE SECRETARY, }  
*Lansing, Michigan, November 27, 1888.* }

HON. CYRUS G. LUCE,

*Governor of Michigan, Lansing, Michigan :*

DEAR SIR:—Act No. 230, Laws of 1885, provides for the prevention of the introduction and spread of cholera and other dangerous communicable diseases, through a system of inspection on lines of travel, and the isolation and disinfection of infected persons and things.

The act is as follows:—

Act No. 230, Laws of 1885, entitled, "An act to provide for the prevention of the introduction and spread of cholera and other dangerous communicable diseases."

SECTION 1. *The people of the State of Michigan enact*, That whenever in the opinion of the governor it may be deemed necessary, he may draw from the general fund, on the warrant of the auditor general, not to exceed the sum of ten thousand dollars (\$10,000), to be used by the State Board of Health, to prevent the introduction or spread, in this State, of cholera or other communicable diseases dangerous to public health.

SEC. 2. At such ports or places, or on such lines of travel as there may be danger of the introduction into this State of cholera or other dangerous communicable diseases, the State Board of Health shall have power to establish such systems of inspection as may be practicable and needful to ascertain the presence of the infection of cholera or other dangerous communicable disease in the persons of immigrants or travelers, in wearing apparel, baggage, or freight; to question on oath, without cost to the State or person so questioned, which oath a duly appointed inspector of the State Board of Health is hereby authorized to administer to the immigrant, traveler, or other person, as to the place from which the suspected person, baggage, or freight came, the time elapsed since his or its exposure to cholera or other dangerous disease, and on other subjects on which information is needed; and the State Board of Health shall have power to order such disinfection of baggage or other articles which are infected or liable to be infected, and to cause such isolation of persons or things infected, or liable to be infected, as may be necessary for the public safety, by placing it or them in the care of the local board of health, or by other practical methods, to the end that the object of this act, expressed in its title, shall be fulfilled.

SEC. 3. It shall be the duty of the State Board of Health, to frame and publish rules for the conduct of inspection under this act. Whoever shall willfully violate the rules of the State Board of Health made in pursuance of this act, shall on conviction be deemed guilty and punished as in cases of misdemeanor.

In accordance with section 3, the State Board of Health has framed and published rules for the conduct of the inspection under the act, and the inspection was for a time

maintained during the serious epidemic in Montreal. The greater portion of the appropriation, however, remains unused, and this Board is prepared to maintain such inspection "whenever in the opinion of the Governor, it may be deemed necessary."

The facts as to the present threatening of small-pox are as follows:—

Small-pox is a disease which usually appears in waves, which frequently go throughout the world. The years of greatest prevalence in this State have been 1873, 1877, and 1882. The year of expected maximum prevalence was 1887 which did not occur, so that it still hangs over us.

Small-pox has been reported to this office from other States as follows:—From Ontario, Nov. 16; Pennsylvania, Nov. 10; Montreal, Nov. 3; Illinois, Oct. 24; Iowa, Oct. 11; Minnesota, Sept. 29; Ohio, Aug. 23; Connecticut, Aug. 21. Small-pox is now somewhat prevalent in the State of New York.

Small-pox has occurred recently at two places in this State, the facts concerning which are as follows:—

Nov. 16, 1888, a notice was received from Peter H. Bryce, M. D., Secretary of the Provincial Board of Health of Ontario, stating that up to that time there had been ten cases of small-pox in Sarnia and vicinity, and stating that "the origin of the disease is supposed to be one case that had its origin in Buffalo."

A letter from Dr. Johnston, of Sarnia, states that he has ascertained that there are 19 other cases north of Toronto "off the direct line of travel, and most of them convalescing."

A letter from H. R. Mills, M. D., Port Huron, dated Nov. 16, 1888, states:—

"However, people here are getting somewhat anxious as to the state of affairs, and numbers are asking if we are not intending to stop ferries, or at least put an inspector over them. My report of the case in Saginaw has been found correct.

"Just at this moment while writing, Col. Farrar, U. S. Consul at Sarnia came into my office and reports as follows:

"The first case in Sarnia was a Mr. Higgins, who keeps a fruit store next to the post-office. This case was not reported as small-pox until after the man had been sick for more than two weeks. No quarantine was established until after that time. Large numbers of people were visiting the store daily during the whole period. Mrs. Poquette, who went to Saginaw and has since come down with small-pox, lived up stairs over the store with this Mr. Higgins. All lived close together in this building.

"This woman escaped to Saginaw as I said before, and the papers reported her sick with small-pox. The case in the city (Port Huron) in my opinion was varioloid, or varioloid modified by vaccination. Capt. Thomas has friends in Sarnia where this little girl had been visiting before being taken sick; at least, so I am informed. So, we see how closely her case was connected with the Sarnia cases. Dr. Wilson of this city saw the little girl when she was taken, and unhesitatingly pronounced it small-pox."

Dr. A. G. Bissell, health officer of East Saginaw, states, Nov. 24:—

"The small-pox case is progressing favorably. So far, no new cases have developed, though the exposure was great. Will keep you advised of anything that may turn up."

No further cases have been reported in Saginaw.

No further cases have been reported from Port Huron.

Concerning the establishment of an inspection service, Dr. W. J. Duff, health officer of Port Huron, Nov. 16, says that he would, if more cases are developed in Sarnia, "deem it advisable. But at present there are only eight [ten?] cases, and those according to Mr. Ley's statement (President of the Sarnia Board of Health) are well quarantined, but this does not stamp out the disease; and it would be well to be prepared to take immediate action, if any new cases should be reported."

Very respectfully,

HENRY B. BAKER, *Secretary.*

As may be inferred from the foregoing, the developments relative to small-pox were being carefully watched. At that time it was not considered by the Governor to be necessary to use any portion of the contingent appropriation, mentioned in Act No. 230, Laws of 1885. Later, in the year 1889, action was taken under that act, and an account of it will appear in the next Annual Report of this Board.

#### SMALL-POX IN OTHER STATES, IN 1888.

The following outbreaks of small-pox in localities outside of the State of Michigan were reported to this office in compliance with the resolution

adopted by the International Conference of State and Provincial Boards of Health, held at Toronto, Ontario, October 6, 1886:

At San Francisco, California, October 26, 1888.

In Granby township, Shefford county, P. Q., October 22, 1888.

At Metropolis, Illinois, May 28, 1888.

At Sarnia and vicinity, Ontario, November 16, 1888.

In Toronto, Ontario, September 25, October 9, and October 16, 1888.

Small-pox had also made its appearance at several places in Michigan, and, in order to prevent its spread, on December 7, 1888, the following circular letter was sent to all the health officers in Michigan:

## SMALL-POX.

NOW IS A GOOD TIME TO BE VACCINATED.

*To the Health Officer:*

DEAR SIR:—Small-pox tends to re-appear after somewhat regular intervals of time; thus the maximum deaths from small-pox in Michigan have been reported in 1872, 1877, and 1882. A wave of small-pox might have been expected in 1887; inasmuch as it did not occur, there is probably a large number of people in Michigan now susceptible to this loathsome disease, and the wave may not be much longer deferred. During the past year the disease has occurred in an unusual number of places throughout this country; but, through the efforts of health authorities, the disease has not spread much in the various localities nor caused a very great mortality. But it is well known that it is very much easier to suppress small-pox in summer than in winter, and the number of infected places in this country, and in foreign countries from which immigrants and travelers come should, under the circumstances, be taken as a warning which should lead to unusual efforts to prevent this disease.

*The Preventive Measures are Vaccination and Re-vaccination.*

Permit me to again ask your attention to resolutions passed by the State Board of Health at its last meeting, October 23, 1888, and published on pages 4 and 5 of the "Proceedings" which have been distributed, but because of recent developments may be repeated as follows:—

*Local Boards of Health Should Recommend Vaccination.*

The following resolution offered by Dr. Lyster was unanimously adopted:

*Resolved*, That in view of the recent outbreaks of small-pox in Buffalo, N. Y., Toronto, Ontario, and other places, it is recommended by the State Board of Health, that the several boards of health of the cities, villages and townships in Michigan, be requested to recommend the vaccination of all unprotected persons within their jurisdictions.

The law under which general vaccination may be favored by local boards of health, is as follows:

Act No. 146, Laws of 1879, entitled, "An act to authorize boards of health of cities, villages, and townships to furnish vaccination to the inhabitants thereof."

SECTION 1. *The People of the State of Michigan enact*, That the board of health of each city, village and township may, at any time, direct its health officer or health physician to offer vaccination, with bovine vaccine virus, to every child not previously vaccinated, and to all other persons who have not been vaccinated within the preceding five years, without cost to the persons [person] vaccinated, but at the expense of such city, village or township, as the case may be.—§ 1685 Howell's Statutes.

Bovine vaccine virus is propagated by E. L. Griffin, M. D., Fond du Lac, Wisconsin. Virus is for sale by most druggists.

The State Board of Health does not supply vaccine virus.

Small-pox is present in Buffalo, N. Y.; in Ontario, from whence many lumbermen go into the pine woods of Michigan; one case has occurred at Port Huron, Michigan; one in East Saginaw; one in Lansing; one in New Haven, Shiawassee county; one in Detroit; and three cases in Howell.

It is respectfully suggested that unusual watchfulness should be maintained, and suspicious cases carefully isolated, that all persons exposed directly or indirectly be promptly vaccinated, and all infected material destroyed or disinfected.

I trust you will promptly notify this office on the occurrence of any suspicious case, and, as the law requires, keep this office "constantly informed respecting every outbreak of a disease dangerous to the public health, and of the facts \* \* \* respecting sources of danger of any such diseased person or infected article being brought into or taken out of" the township, city or village of which you are the health officer.

Any aid which this office may be able to give you will be cheerfully rendered.

By direction of the State Board of Health.

Very respectfully,

HENRY B. BAKER,

Secretary.

Lansing, Mich., Dec. 7, 1888.

## GLANDERS IN MICHIGAN DURING THE YEAR 1888.

The following reports of Glanders in Michigan during the year 1888, were received at the office of the Secretary of the State Board of Health:

### *A fatal case of Glanders in Man, in St. Joseph County.*

The State Republican, January 14, contained the following items:—

"J. S. Major, of Centreville, died Thursday of glanders, contracted by leading a glandered horse."

"The death of a man in Centreville from glanders caught from a horse is another terrible warning of the necessity for the prompt and strict enforcement of the law that requires the killing of every animal affected with that dangerous disease."

January 16, the following letter was sent to W. A. Crandall, health officer of the village of Centreville, St. Joseph county:—

"DEAR SIR:—It is reported in the State Republican of January 14, that J. S. Major of Centreville died Thursday of glanders. Will you have the kindness to give me the details concerning this case as soon as convenient? \* \*

"By this mail I send you pamphlet with marked paragraphs concerning this subject."

The following reply was received from Dr. Crandall:—

"Yours of the 16th inst. at hand. In reply will say that John S. Major recently died from blood-poisoning, supposed to have come from an injury to the hand. What information I have concerning the case I got from Dr. Sabin, the attending physician.

"The particulars of the case are as follows: Mr. Major had recently purchased a Texas pony, from a drove that had been shipped here from Kansas for disposal. The pony had quite a discharge from the nostrils similar to pus, from what I can learn. While endeavoring to break the pony to lead with a long rope attached, a little skin was torn from the back of the hand. The abrasion was covered with some court-plaster. This occurred January 3d. On the 6th the doctor was called to see the case, complaining with aching pains all over the system, accompanied with chilly sensations and fever. The 8th the doctor was called again, when he discovered an enlargement of the lymphatic glands extending from the injury on the hand to the shoulder; and underneath the arm were formed little kernels; upon the thighs were found small pustules, and deeper formations filled with a reddish pus. On the 9th counsel was called, and an unfavorable prognosis pronounced.

"The patient had a great thirst for acids and liquors of various kinds. Abscesses formed upon all the extremities, which were opened,—the opening causing no particular pain, the doctor making mention of that as being remarkably strange. Hands and feet were blue and cold, representing mortification. Was unconscious about 36 hours before death; died the 10th.

"The disease of the pony was pronounced by our veterinary surgeon to be nasal gleet, which would, he claimed, turn into glanders. The pony was killed, and there has been no further developments of the disease that I have learned."



*Glanders at Port Huron.*

Rumors having reached this office that glanders was present at Port Huron and vicinity, a letter was sent to Hon. H. H. Hinds, asking for information in regard to the same. The following reply was received:—

"Replying to your esteemed favor of yesterday, I beg to state that one case pronounced by the State Veterinarian as glanders has recently been found in St. Clair county, and my associate, Mr. Moore, is handling the matter. \* \* \*

"Glanders has been found in a good many different places in the State within the last year." \* \*

*Suspected Glanders in Missaukee County.*

The following was received from E. D. Moore, health officer of Norwich township, Missaukee county:—

"I have reason to believe that there are glandered horses in a lumber camp within my jurisdiction, but am not sure. \* \* \* Please inform me what to do in the matter."

The following reply was sent:—

"Please accept thanks for your letter concerning glanders. I inclose a copy of the Live Stock Sanitary Laws of Michigan, in which I have marked paragraphs from which you will see that it is the duty of any person, who discovers or suspects that any animal under his observation is affected with glanders, to report such fact to the State Live Stock Sanitary Commission."

Nothing more was learned at this office in regard to this supposed outbreak.

*Glanders in the City of Muskegon.*

The following telegram was received, September 27, from Dr. B. D. King, health officer of the city of Muskegon:—

"Case of glanders here, send State Veterinarian."

The State Veterinarian was informed of the outbreak at once, by telephone, and Hon. H. H. Hinds, by letter. Nothing further was learned of the matter.

## AN EPIDEMIC OF CHOLERAIC DYSENTERY IN PRESQUE ISLE COUNTY, MICHIGAN.

In the latter part of the month of August, dysentery in an epidemic form appeared in Rogers, and adjoining townships in Presque Isle county. Letters asking for particulars, were sent from this office to the health officers of the different jurisdictions. Pamphlets of instructions on the restriction of diseases of this character were sent to the several health officers.

Below are given quotations from some of the replies to letters of inquiry sent from this office:—

"There were four deaths in my township from choleraic dysentery, but am glad to say the disease is now stamped out.

"Two infants died of this disease, one girl about eleven years old, and one old lady." \* \* \*  
—*Christian Klee, Supervisor, Belknap Township.*

James B. Patterson, M. D., a physician residing at Rogers City writes September 15, as follows:—



"In reply to your favor I will say that the trouble was *epidemic dysentery*, and that I saw and treated 231 cases to date, in all stages. Ten deaths have occurred, all but one under four years of age. Only one death occurred when patient was seen in the earlier stages, and he died of pneumonia on the 8th day. Two cases died from collapse in two and three weeks, due to perforation of intestines. Rest died from exhaustion in spite of stimulants, food, etc., and all were seen first time within 24 hours of death.

"It was very contagious, but was successfully controlled by using chloride of lime for stools, and isolation.

"There are only four cases at present in the county."

Of the source of the contagium of this outbreak, William Godin, health officer of Ocqueoc township, writes:—

"We are now more than convinced that the fearful and fatal Hammond's Bay fish cholera had its origin from the putrid fish entrails at Ryom's fishery at Hammond's Bay. The smell of the putrid entrails has been overpowering this summer, and scores of evidences can be obtained in support.

"Ryom don't bury *all* his fish entrails, and winds from Lake Huron waft the disease across the country.

"Nine-tenths of the men working on the Oqueoc and Hartwell's mill became sick and the distance is two miles from Ryom's fishery. The disease was then communicated through the country. We have smelled the putrid smell at our place, seven miles distant.

"Some have blamed the water, but its purity and excellence is hard to excel.

"The fishery lies in the town of Rogers, postoffice address Rogers City.

"We will gladly reply to any inquiries respecting this nuisance." \* \* \*

## AN ALLEGED EPIDEMIC OF PNEUMONIA IN INGHAM COUNTY.

It was reported that between February 18 and March 28 an epidemic of pneumonia, perhaps complicated with meningitis, occurred in the township of Bunker Hill, Ingham county, with 22 cases and 5 deaths.

From February 18 to March 14 there occurred eight cases (four of them fatal) in people, who were members of one family, and persons related to that family. This would suggest that the disease was contagious, or that the source of contagium was concealed in the dwelling of the family. An effort was made by this office to get a sanitary survey of the premises occupied by the different patients, but nothing definite was obtained.

Dr. C. L. Randall, of Dansville, writes, that the symptoms were:—

"Taken with a chill, temperature 102 to 106, average 104. Profuse perspiration on head and face and tendency to collapse. Marked delirium, pupil contracted, right lung affected in all. In fatal cases, coma, and frothing from mouth preceding death."

## A FORM OF CHOLERA CAUSED BY EATING CANNED MACKEREL.\*

The following letter, dated July 1, was received from Carl M. Bock, M. D., of Gowen, Montcalm county:—

\* \* "On June 22d I was called to attend a family living in this place, who had been poisoned by

\* Details of "twelve to twenty" cases of poisoning by tyrotoxin in cheese, at Monroe, Michigan, are given in the first part of this Report. That part, pagged in Roman numerals, which relates to the Proceedings of the Board July 10, 1888.

eating canned mackerel, which had been opened and remained in the original can some 48 hours. I saw the patients five hours after eating the fish, and found them—six in number—with the precise symptoms of cholera Asiatic, but of course in a mild form. They were all vomiting freely, had frequent and copious watery discharges, thirst, cold extremities, and slow pulse, and one suffered badly from collapse, (a child five years old). All had a slight secondary fever. Considering the time elapsed and small quantity of the fish eaten (as part of the mackerel in the can had been used a couple of days before) I did not consider it prudent to waste time with antidote treatment, but treated the cases as a cholera, with satisfactory results. I could not obtain any portion of the mackerel—nor the can even—for analysis.”

As some of the mackerel from this can had been used “a couple of days before” and no mention is made of its then producing injurious effects, it seems probable that the poison was a ptomaine which was developed in the process of decomposition of the fish. Vaughan defines a ptomaine as “a chemical compound which is basic in its character, and which is formed during the putrefaction of organic matter.”\*

Brieger gives the following ptomaines of putrefied fish:

1. Ethylene-diamine.
2. Animal muscarine.
3. Gadinine.
4. Triethylamine.†

Animal muscarine is a violent poison, and probably others of this group are poisonous.

Vaughan gives other ptomaines found in putrefied fish, among which are *hydrocollidine* and *putrescine*, which are very poisonous.

## INJURIES AND LOSS OF PROPERTY ALLEGED TO HAVE BEEN CAUSED BY ILLUMINATING OILS IN MICHIGAN DURING THE YEAR 1888.

That kerosene oil was formerly a dangerous fluid for domestic use cannot be denied, yet of the six reports received relative to injuries done to persons and property by fires said to have been caused by the use of illuminating oils during the year 1888, only three contain positive evidence that the injury was caused by the actual explosion of a lamp containing kerosene oil.

A summary relative to the “flashing point” of the oil alleged to have caused the fires and injuries in the six instances, according to tests made after the fires or injuries, is as follows:—

Fire in Bradford’s Hotel, Muskegon:—

“At 128 degrees there was a slight flash.

A. T. KEDZIE, Dept. Oil Inspector.”

Fire in the city of Muskegon:—

“No flash below 126 degrees.

A. T. KEDZIE, Dept. Oil Inspector.”

Fire in the city of Port Huron:—

“It stood 123 degrees.

ALICE E. C. MANN, Dept. Inspector.”

\*“Ptomaines and Leucomaines,” etc., by Victor C. Vaughan, Ph. D., M. D., and Frederick G. Novy, M. S., p. 15.

†“Diseases of man: Their Nomenclature, Classification and Genesis.”—By Gouley, p. 279.

Burning of the Michigan Wood Pulp Company's mills at Niles:—

"Inspected by me and stands 123 degrees.

E. H. SPOOR."

Fire at Kalamazoo:—

"A sample of the oil was inspected and flashed at about 124 degrees.

R. HAIGH, JR."

Fire in the G. A. R. restaurant, at Three Rivers, Dec. 18, 1888:—

"On this occasion it flashed at 128 degrees.

F. B. AINGER, Dept. Oil Inspector."

*Fatal burning of three children, and alleged lamp explosion, at Muskegon.*

Of the deaths of the Howd children at Muskegon, A. T. Kedzie, Deputy Oil Inspector, wrote to Hon. H. D. Platt, State Oil Inspector, as follows:—

"In reply to your favor of the 17th and 21st insts., first as to the cremation of the Howd children at Muskegon last month: Their ages were 1, 3, and 5 years, and were left alone by themselves in this house, with a kerosene lamp burning.

"The coroner's jury renders the following verdict:—

"We find that Osborne P. Howd, Cora Howd, and Walter T. Howd, died of suffocation while sleeping in their home, which was set on fire by the upsetting, or explosion of a lamp, while they were left alone in the house."

"I could not get any of the testimony given before the jury, but find in circulation, the report that the lamp was defective."

In the same letter, the Deputy speaks of another instance as follows:—

"As to the lamp explosion in Bradford's Hotel, Muskegon, last week:—

"At your suggestion I went there today, and inspected oil from the can from which the exploded lamp was said to have been filled. I asked Mr. Bradford to be present and see the inspection, which he and others did. In this I used the thermometer you sent. At 115, 118, 120, 122, and 125 degrees, there was no flash; at 128° there was a slight flash.

"Mr. Bradford said he obtained the oil from the store of A. Fowl, for whom on the 14th instant I inspected 60 barrels, each of which passed 122° without a flash. Mr. B. gives as his most probable cause of the explosion the escape of gas from the gas jet to which the lamp was attached."

*Fatal burning of a child in Detroit.*

The Detroit Evening News of January 14 gave an account of the fatal burning of a child by kerosene oil in that city. The following letter was sent from this office to Coroner Keefe of Detroit:—

"Dear Sir: The Evening News, of Jan. 14, contains an account of a 'fatal kerosene oil can explosion' in the family of William Roblin, 169 West Congress St., and states that the case was investigated by you. Will you have the kindness to give the details concerning this explosion to this office?"

The following reply was received:—

"Yours of the 16th received; the accident you speak of occurred Jan. 11. The child lingered until Jan 13th, 3:30 P. M.

"At about 1:30 P. M. of the 11th, Wm. Roblin attempted to start a fire in the range. Thinking the fire was out—there had been nothing put in since 10 o'clock—he put the kindling on and then got the can and poured on the oil, and then the explosion occurred. He himself was burning, his clothes were on fire, his face was burnt, his hair and mustaches; the child ran right into the fire, the father was afraid to go near him for fear he would make it worse for the child, and a German lady was holding a younger child, for it was trying to get to the fire too. So I concluded not to hold an inquest for it would come to the same verdict as all such cases. Nobody to blame but the father."

*Naphtha in a kerosene lamp explodes, at Grand Rapids.*

The following is a letter from Benj. C. Porter, of Grand Rapids, to Hon. H. D. Platt, State Oil Inspector:—

"The lamp explosion that you ask about occurred in the city hall on May 24th. The man who was injured was employed as finisher by the Phoenix Furniture Co., and was at work on the furniture in the city hall at the time of the accident.

"It occurred at noon. The man was going to heat his coffee over the lamp, which was an ordinary kerosene lamp, but instead of filling with kerosene it was filled with naphtha, naturally when he lit it, it exploded. He was quite badly burned, but no other damage was done. It seems as though the man ought to have known that he could not burn naphtha in an ordinary lamp."

*Fire at West Bay City, caused by carelessness with torches.*

On December 6, 1888, the L. L. Hotchkiss mills of West Bay City were fired and consumed, and it was rumored that the fire was caused by a "lamp explosion." A letter was sent from this office to N. R. Gilbert, health officer, asking for particulars. The following reply was received:—

"In answer to your communication of the 7th inst., I beg to report that the burning of L. L. Hotchkiss' mill in this city, was not caused by an explosion. No lamp exploded, and no poor oil had anything to do with it. The fire was caused by an employé lighting a number of electric torches; had more than he could handle, and let some fall, and instead of stamping out the burning torches, he ran for a pail of water. When he returned with the water the fire had ignited the rubbish in the room and he was not able to put it out. This is all there is to it."

*Death alleged to be from bursting of a lamp, proved to be from handling burning linseed oil.*

An article published in the Fennville Dispatch of December 19, gave an account of the death of a Mrs. Scott Eddy of Ganges, by burning from kerosene, from a lamp explosion. Hon. H. D. Platt, State Oil Inspector, instructed A. S. Kedzie, deputy for that district, to investigate. The following is a copy of the reply received by him:—

"In accordance with your instructions, I went to Ganges and found the residence of Mr. Scott Eddy, and inquired into the cause of the death of his wife, reported in the Fennville Dispatch and Allegan Journal to be by the bursting of a kerosene lamp.

"This report I found to be without warrant as seen by this statement signed by her husband."

The following is Mr. Eddy's statement:—

"My wife lost her life Dec. 13th, 1888, not by the explosion of a kerosene lamp as stated in the papers, but by handling burning linseed oil."

*A fire caused by the explosion of a kerosene lamp in White Oak, Ingham Co.*

The following is a copy of the Deputy Oil Inspector's letter to Hon. H. D. Platt, State Oil Inspector:—

"J. M. Collins, a farmer in the township of White Oak, Ingham county, sustained the loss of his house and contents from the explosion of a lamp about the 15th of September, 1888. The circumstances, as stated by Mr. Collins, are as follows:—

"The lamp in use was an ordinary one, and in common use in most families. The burner in good condition, wick fitting properly, and the bowl of the lamp about two-thirds full of oil of the same quality as that that had been used by the family for a number of evenings before.

"Mr. Collins sat at the table reading a newspaper, about seven o'clock in the evening, and noticing that the light reflected on the paper was different than he had before noticed, he turned toward

the lamp, and saw that it was on fire, burning with a bluish flame inside the bowl of the lamp, and coming up through the chimney, and as he caught the lamp to throw it out of doors, it burst, setting fire to the room and contents, and burning so fiercely that little could be saved from the house. None of the oil could be procured for inspection."

*Lamp explosion, because of the breaking of the lamp chimney.*

Following is a copy of a letter to the State Oil Inspector from R. Haigh, Jr., dated February 25:—

"In reply to yours of the 21st, relative to the lamp explosion that occurred here lately, I have to say that I had already investigated the matter and learned the following facts:—

"The lamp had been left in an unoccupied room for perhaps an hour or so. When the room was entered the lamp chimney was broken and the whole top appeared on fire. The man said he seized the lamp, carried it to the door, and threw it out, and that it exploded or broke during the time, but he cannot tell just when.

"A sample of the oil was inspected and flashed at about 124° These are all the facts I could obtain. My theory of the explosion is that the chimney may have been broken for some time, and it is well known that the metal of a lamp will become very much heated if the lamp is burned without a chimney. Sufficient gas may have been generated to explode the lamp."

## ALLEGED NUISANCES IN MICHIGAN IN 1888.

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Compared with the preceding year, the number of alleged nuisances reported to this office during the year 1888, is small.

During the year 1888, communications relative to alleged nuisances were received at the office of the State Board of Health, from fifteen different localities in the State.

The subjects of these alleged nuisances were as follows:—

Slaughter-houses, hog-yards and pig-pens, 4; offensive sediment from stagnant water in a mill-race, 1; mill dams and ponds, 2; saw-dust dumped into Pine Lake, 1; defective drains and drainage, 3; fish offal, 1; foul ditch on railroad land, 1; overflow of the water of Lake Ann, 1; abatement of nuisances in general, 1.

The following extracts from the correspondence of this Office relative to the above-mentioned alleged nuisances, show the nature of those nuisances, and the action taken and recommended to be taken in regard to them.

### SLAUGHTER-HOUSES, HOG-YARDS AND HOG-PENS.

In March, 1888, P. Curtis, health officer of Silver Creek township, writing to Arthur Hazlewood, M. D., member of this Board, stated that an old slaughter-house, with hog-yard attached, existed by the roadside nearly opposite a dwelling house in his jurisdiction, that the offal from this slaughter-house was thrown into the yard, where hogs were sometimes kept to consume it, and that the whole surroundings of the establishment had become saturated with putrescent and putrefied organic matter which, in summer emitted odors so foul as to be not only exceedingly offensive to human beings, but also so strong as to excite, and to render almost uncontrollable, horses passing near.

After thus explaining the case, Mr. Curtis continues as follows:—

"Please tell me what you would call such a thing as I have tried to describe, and how much of a complaint is needed in order to justify me in removing it. Will you please to tell me what to do in such a case, as I expect to be called on the coming season."

Mr. Curtis' letter was forwarded to the office of the Board by Dr. Hazlewood, and replied to by the Secretary under date of March 20, 1888, as follows:

"DEAR SIR:—I send you by this mail some pamphlets issued by this Board giving opinions and reports concerning slaughter-houses, etc., and the way to proceed in cases of nuisances. The pamphlet on 'Petition for Abatement,' etc., will, I think, give you all the information needed."

The following letter addressed to Dr. Hazlewood, June 18, 1888, by Alexander Casebeer, health officer of the village of Reese, Tuscola county, was forwarded to this Office:—

"DEAR SIR:—We have a little trouble in our village in regard to a slaughter-house, within the corporation, which has become a great nuisance and I deem it very detrimental to the health of our people. I made a report to the village board of health at their last meeting, held the 14th of this present month, and the board of health ordered the marshal to notify the parties to discontinue the use of the building as a slaughter-house; but the parties take no notice of the same, and continue the nuisance by leaving the offal exposed to the sun. Can you give us any remedy to abate the same, and what is the best course to take, as a board of health, and more particularly in the performance of my duty as health officer? Any advice from you will be thankfully received."

In reply to Mr. Casebeer's letter, the Secretary of the State Board wrote to him June 21, 1888, giving him the information asked for; and at the same time sent him documents containing all necessary information in regard to the legal course to be pursued by health officers and local boards of health, in the abatement of nuisances.

August 8, 1888, a correspondent in Easton, Ionia county, wrote to Dr. Hazlewood, as member of a committee appointed by the State Board of Health to investigate certain alleged nuisances in connection with slaughter-houses situated near the State House of Correction at Ionia, asking for information in regard to the action of that committee.

The following letter dated August 11, 1888, addressed to the above-mentioned correspondent by the Secretary of the Board, explains the action taken in this case:—

"DEAR SIR:—Your letter to Dr. Hazlewood, of this Board, has been referred to this Office. I send you herewith a pamphlet in which I have marked a paragraph giving an abstract of the report of the Committee of this Board appointed to investigate the slaughter-houses near the State House of Correction.

"I also send you a pamphlet, in which I have marked paragraphs, for which you will see that in the matters pertaining to nuisances where there is not a plain, adequate and complete remedy at law, the circuit court for the county has equity jurisdiction to grant injunctions to prevent or stay nuisances. If the local board of health does not make complaint, any person injured or annoyed thereby may do so. But it is the duty of the local board of health to act in every case where there is a public nuisance."

A citizen of Laingsburg, Shiawassee county, wrote to the Secretary June 21, 1888, as follows:—

"There is a public nuisance here consisting of a hog-pen containing several hogs and the stench is terrible. There have been several complaints entered to our village justice, who, for some unknown reason, refuses to act on the same. Please let us know how this thing can be removed."

There were also two postal cards dated June 21 and June 25, 1888, received by the Secretary from W. E. Ward, health officer of Laingsburg, in each of which this alleged nuisance was mentioned. In the former postal he (the health officer) writes:—

"What is to be done in case of a large pig-pen located in the near vicinage of many residences whose occupants are complaining of the intolerable odors?"

In the latter:—

"Our hog-pen man is obdurate and will not heed commands to abate the nuisance. Shall we call on prosecuting attorney?"

In reply to these communications the Secretary wrote to W. E. Ward stating that the local board of health was authorized to examine into all nuisances and to prevent or to remove them as the case might be; but where the person refused to obey the orders of the local board, and if there is doubt as to the supposed nuisance being a nuisance in fact, complaint should be made before the circuit court and a judicial order secured.

Notice of the action taken by the Secretary was sent to the other complainant in this case.



## OFFENSIVE SEDIMENT FROM A MILL-RACE.

March 20, 1888, a correspondent wrote to the Secretary of the Board from Birmingham, Oakland county, as follows:—

"On my farm is a mill-pond from which water is taken to run a mill close by on another man's premises. The race through which the water is conducted to the mill runs within five rods of my house, parallel with and immediately by the public road, which also runs alongside of my premises. In times gone by the proprietors of the mill have been in the habit of cleaning the race and throwing the mud along the road, and in some cases within a rod or two of my house. This mud is strongly tinctured by the black sulphide of iron and vegetable matter, which causes it to send forth an intolerable and sickening stench.

"Rather than to have trouble with my neighbors I have borne with this sort of thing without complaint. They are now about to clean the race again and purpose to throw the mud along the road, as they have formerly done, notwithstanding my remonstrances.

"I design to take some sort of action against them. I desire to know what kind and degree of protection your board and the State health laws afford me. Have you full jurisdiction in the matter, or will I have to appeal to the courts? Have you mandatory or enjoining powers to prevent the mud being thrown there, or to order that it be carried away?

"If I have to appeal to the courts, can I do so in behalf of the people, or must I bring a private action? Can they gain a prescriptive right to befoul the air and endanger the health of my family?

"In case that they should plead that the mud and the stench arising from it are not unhealthy, would I be compelled to get expert scientists to prove the contrary? Please to state how I must proceed to bring the case before the proper authorities."

The following extract from a letter by the Secretary, March 21, 1888, in response to the foregoing communication, shows the advice given:—

"This Board has no mandatory or enjoining powers relative to nuisances. Its powers are advisory. The law authorizes and requires the local board of health to examine into all nuisances and to order their removal, but the board of health declaring a thing to be a nuisance does not make it a nuisance if it is not one in fact, and 'where there is not a plain, adequate and complete remedy at law the circuit court of any county has equity jurisdiction in all matters relating to nuisances.'\*

"Such a nuisance as you describe would, I think, be a private nuisance, but of this I am not certain. Facts may have been omitted by you which would change this view. I doubt if any one can acquire a prescriptive right to maintain a nuisance which corrupts the atmosphere with noxious smells even after twenty years, though there is some confusion on this point in the decisions of the courts in the different States. Concerning this point, however, and the methods of procedure, you had better consult the prosecuting attorney. My own opinion is that application to the circuit court, or to the judge in chancery for an injunction to prevent the nuisance, is the most promising course to pursue."

## MILL DAMS AND PONDS AS ALLEGED NUISANCES.

Communications were received at this Office from several persons in the village of Mount Pleasant, relative to an alleged nuisance there, the nature of which is explained in the following extracts from the said communications:—

July 18, 1888, E. S. Bowen, trustee of Mount Pleasant, wrote:—

"Mount Pleasant has a mill pond which is considered a cause of much sickness. Parties controlling the streams or dams above us are constantly holding water back so that our pond much of the time is dry, or nearly so. Our board of health have no control over dams, etc., in other towns. Has the State Board of Health jurisdiction in such matters? Or what is our remedy?"

July 19, 1888, the following was received by the Secretary from M. F. Fasquelle, health officer of Mount Pleasant:—

\* Section 6377, Compiled Laws of 1871, § 7965 of Howell's Annotated Statutes.



"I write you concerning the mill pond at this place. I will state the facts, then you can understand the condition of things.

"The pond is almost empty, caused by the water being held in dams above this place, for the purpose of flooding, to run logs out of Coldwater Lake (some twenty miles above here by river). It is also held at Littlefield Lake several miles above Coldwater. Then there are several dams on the north and south branches of the river still above there, which are said to be closed.

"What I want to know is, if there is not some way that this condition of things can be changed so that we can get the natural flow of the river.

"The stench from the river is terrible and if not remedied soon I do not see why it will not make a great part of the inhabitants of this village sick."

July 24, 1888, A. S. Coutant, publisher of the Isabella County Enterprise, wrote to Dr. Avery, President of the Board, by postal card, as follows:—

"I send you an Enterprise marked, detailing a situation on the Chippewa river which runs through here, that is anything but agreeable. Can not the State Board of Health take hold of the matter and help us out? This state of things has done more to injure Mount Pleasant than anything that could possibly happen to us."

The marked paragraph referred to above is as follows:—

"Following each succeeding flood are several days of withholding the water in the dams above. During these days the water below becomes drawn down to the point which produces diphtheria, typhoid fever, scarlet fever, malaria, rheumatism and kindred ills."

The above-mentioned postal card and Enterprise paragraph were referred to this Office by Dr. Avery, and a letter from A. S. Coutant, dated July 30, 1888, relative to this subject was also received by the Secretary. The following extract from said letter gives further information as to the nature of this alleged nuisance:—

"I desire to state that the matter under consideration is wholly beyond the jurisdiction and territory of the local board of health, and lies at various points on the river for about twenty miles above this point.

"The method is to withhold the water from flowing for several days at a time, and when a sufficient amount has accumulated, to let it all down at once for the purpose of floating down logs. Now whenever this occurs the Mt. Pleasant mill-pond, which comprises many acres—perhaps 100 all told—becomes drawn very low and large tracts become exposed to the sun and air. This causes a great stench, which arises and floats over the town. Our prevailing breeze here is from the west and southwest and the town lies east and north of the great pond.

"This has occurred year after year, and if you will search your records you will find that on or about the late fall and early winter weeks, there have been reported cases of scarlet fever, malignant diphtheria and such diseases in large numbers, if the local health officer has done his duty. \* \* \*

"The people of this place have come to the decision that this must not be tolerated any longer and have employed counsel to take legal steps to stop the curse.

"We have 3,000 people here and it is of vital importance to the thrift and growth of the place, as well as for the health of our people, that the nuisance be abated." \* \* \*

The following letters written by the Secretary, fully explain the advice given relative to this alleged nuisance:—

"July 20, 1888. To M. F. Fasquelle, M. D., health officer of Mount Pleasant.

"DEAR SIR:—In reply to your letter, I send herewith a pamphlet from which you will see that in all matters pertaining to nuisances, where there is not a plain, adequate and complete remedy at law, the circuit court of the county (or the circuit judge sitting in chambers) has equity jurisdiction.

"An application should be made for an injunction to stay or prevent the nuisance at once, to the circuit judge."

"July 27, 1888. To A. S. Coutant, Publisher Isabella County Enterprise, Mt. Pleasant.

"DEAR SIR:—Your postal card of July 21, to Dr. Avery, has been referred to this Office. In reply, I send you a pamphlet from which you will see that the abatement of a nuisance is the work of the

local board of health. However, a local board of health declaring a thing to be a nuisance does not make it so if it is not one in fact, and where there is as much money interest at stake as in the present instance, it is probable that the fact will be questioned, and it is not probable that the *order* will be obeyed. Besides, I understand that some of the dams which control the flow of water in the stream are not within the jurisdiction of your local board,—that consequently there is not a ‘plain, adequate and complete remedy at law.’ In all cases where there is not a ‘plain, adequate and complete remedy at law,’ the *circuit court for the county* [or the county judge sitting in chambers] has *equity jurisdiction*, to grant *injunctions to stay or prevent nuisances*. See § 7965, Howell’s Statutes. If the local board of health refuses to make the complaint, any one injured thereby may make the complaint.

“I trust that this will be promptly attended to by your local board. I shall be glad to learn what action is taken and with what result.”

“August 1, 1888, A. S. Coutant, \* \* \* \*

“Please accept thanks for your letter of July 30, concerning the nuisance. In communications to E. S. Bowen, village trustee, July 19; to Dr. Fasquelle, health officer, July 29; and to yourself July 27, I have pointed out clearly how to proceed to secure the abatement of the nuisance, and from the letters received, I am glad to see that you and your people are alive to the necessity of taking the action. This being the case, I can see no reason why you should not be successful. I shall be glad to hear how successful your people are before the circuit court in securing the abatement of the nuisance.

“If officers or members of this board can be of further service in this case, it will give us pleasure.”

The following is an extract from a paragraph in the *Enterprise* of August 2, 1888:—

“The board of health have employed H. H. Graves to look up the law and take the necessary legal steps to compel the discontinuance of the nuisance.”

#### SAW-DUST DUMPED INTO PINE LAKE.

A. J. Delacy, health officer of Boyne City, wrote to the Secretary April 30, as follows:—

“I shall have to ask your advice in regard to owners of mills dumping their saw-dust into Pine Lake. I have just put a stop to it here. I did so because the timber cut here is mostly hard wood, and after the saw-dust lies in the water a certain length of time it sours and ferments and the stench that arises from it is dreadful—but there are other mills a short distance from us who still persist in dumping their dust into the water. I shall feel thankful for any information which you can give me upon this matter.”

In reply to this letter, the Secretary wrote to Dr. Delacy, May 4, 1888:—

“In reply to your letter of April 30, concerning the dumping of saw-dust into Pine Lake, I inclose a pamphlet with marked paragraph, from which you will see that the circuit court has equity jurisdiction in the prevention of nuisances where there is not an adequate remedy at law. I presume this is the case in the instance to which you refer.”

#### ALLEGED UNSANITARY CONDITION OF A HOTEL.

H. M. Warren, health officer of Jonesville, wrote to the Secretary, May 26, 1888, as follows:—

“The sanitary condition of the ‘Grosvenor,’ the principal hotel in this place, is in a very dangerous state, due to the drainage from wash-rooms, etc., flowing under the basement floors, where it has been accumulating for a year or more. My notice being first called to it May 11, an order was given the landlord to promptly abate it. No attention being given to it, last Monday instructions were asked of the local board, who ordered me to forthwith remedy this state of affairs. The occupant being in possession only since April, thus inheriting the trouble, is really unable to bear the expense, while the owner resides in Coldwater and is indifferent. The danger is great and no

delay should exist in remedying it, yet I am at a loss as to the better way of reaching a solution. Shall I commence proceedings against occupant or await the owner's arrival, June 1, and attack him?

"An early answer will reach me Monday noon via. L. S. & M. S. I wish you were near so you could personally examine it."

In response to this letter the Secretary wrote to Dr. Warren, May 28, as follows:—

"In reply to your letter of May 28, I would say that you had better consult your prosecuting attorney, as to the person against whom to commence proceedings. Concerning one point which you mention, however, allow me to suggest that the law provides that the *board of health* shall order the abatement of nuisances. The health officer, as such, has no right to do this. You stated that you ordered the nuisance abated. This order should have been given by your local board of health, and if not obeyed, the nuisance abated by the board of health, at the expense of the 'owner or occupant' or 'such other person as shall have caused or permitted the same.'"

#### CHOKED DRAIN BENEATH A MOLDING FLOOR.

June 30, 1888, C. L. Chandler, health officer of the township of Richmond, wrote to the Secretary of the Board, as follows:—

"There is a drain running in the rear of one of our business blocks and underneath the floor of the foundry, where it is blocked. The proprietor of the foundry, who is also the president of the village, refuses to let the water have a free outlet through his premises. What course can we pursue to compel him to open the drain underneath the molding floor? Will you please send me a copy of the law in regard to health, nuisances, etc.?"

The following letter, dated July 1, 1888, was written by the Secretary in reply to Dr. Chandler:—

"I send you herewith a pamphlet concerning the abatement of nuisances. In the present case I do not see how you can get any remedy except by going to the circuit court (or the circuit judge sitting in chambers) which has equity jurisdiction in all cases where there is not a plain, adequate and complete remedy at law. I do not know that you would be successful there. Of course a sewer is one thing and a drain is another. I do not see how a drain could become such a nuisance unless used as a sewer. Perhaps I do not understand the conditions as your letter is short, and not very explicit."

#### HAVE LOCAL BOARDS OF HEALTH POWERS TO CONSTRUCT DRAINS FOR THE BENEFIT OF THE PUBLIC HEALTH?

William H. Denison, town clerk of the township of Tittabawassee, wrote to the Secretary, June 13, 1888, as follows:—

"I am requested to ask you to give a written opinion on the following question: Has the board of health of a township any authority to construct any drains in the township for the benefit of the public health, or is that the special duty of the township drain commissioner?" \* \* \*

The Secretary, replying to this question, wrote to Mr. Denison, June 16, 1888:—

"I do not know of any law giving township boards of health authority to construct drains."

#### FISH OFFAL.

W. B. House, M. D., health officer of Detour township, wrote to the Secretary, May 28, 1888:—

\* See sections 25, 26, 27, Pub. Health Laws, p. 8, being (1699), (1700) and (1701) C. L. 1871, and §§ 1640 1641 and 1642 of Howell's Statutes.

"Please send me laws relating to the disposal of fish offal, and tell me how the law is to be enforced. It is a great nuisance here."

In reply to this letter the Secretary wrote to Dr. House, May 28, 1888, as follows:—

"I send you herewith a copy of the law relating to the disposal of fish offal. You will see that it is an excellent law,—for the *protection of the fish*.

"I will be glad to know whether you can make use of the law for the protection of the public health, also, if you can, how you do it, and if you cannot, whether you can recommend a proposed law which would serve that purpose."

#### FOUL DITCH ON RAILROAD LAND.

The following petition addressed to the Secretary, was received at this Office July 18, 1888:—

"We would respectfully call your attention to a *ditch* which runs on *railroad land*. The railroad company neglects to clean the same, to the detriment of the public health, and we the health officer of the township of Elba, Gratiot county, Mich., and health officer of the village of Ashley, county and State aforesaid, make complaint to the State authority of the same. What can your board do in the premises? We would be pleased to see you here to look over the ground. Something must be done. The stench is terrible. Advise at once. We are afraid of some disease springing from the many cess-pools along the ditch.

Signed,

W. A. HALE, M. D.,

*Health Officer of Ashley.*

E. MEACHAM,

*Health Officer and Supervisor of the Township of Elba."*

In reply to this petition the Secretary wrote to the petitioners under date of July 18, 1888:—

"GENTLEMEN:—\* \* \* I send you herewith a pamphlet in which I have marked paragraphs from which you will see that this Board has no authority to enforce or order the abatement of nuisances; this is the work of the *local* board of health, or, in certain cases, the circuit court. If the order of the local board to abate a nuisance is not obeyed, then complaint may be made before the circuit court, or the circuit judge sitting in chambers, who has power to grant injunctions to prevent nuisances. In all matters concerning nuisances where there is not a *plain, adequate* and complete remedy at law, the circuit court has equity jurisdiction. You should apply at once to your circuit court, or if not in session, then to the judge, who is able to grant injunctions in such cases."

#### OVERFLOW OF THE WATERS OF LAKE ANN.

Complaints were received at this Office in August, 1888, from several citizens of Almira, Benzie county, to the effect that, owing to the damming of the Plat River, by the Jas. Kennedy and Seeman Lumber Co., the level of the water in Lake Ann had been raised five feet, which caused the water to overflow, and flood the property of the complainants, destroying their crops, converting their land into a marsh and causing much sickness by malarial emanations.

In reply to the above mentioned communications, the Secretary wrote to the complainants giving them full instructions as to the proper legal procedure in order to secure the abatement of the alleged nuisance, and informing them that he had written to the health officer of the township concerning the matter.

August 14, the Secretary wrote to the health officer of the said township informing him of the complaints which had been formulated, and sending

him pamphlets and written instructions bearing on the subject of nuisances and the means to be adopted in abating them.

In reply to the Secretary's letter, the health officer (Leon D. Spafford) wrote, August 20, as follows:—

"I received notice by you of the complaint in regard to the raising of Lake Ann in this township, today. The lake has been raised for the purpose of drawing logs; but not five feet. As to its having been any injury to the public health, there has been no sickness yet around the lake that I have learned of; but I do not think that it would be wise to have the water drawn off at the present time. There has been no complaint to the board of health; but I will look into the matter and report to you."

In accordance with his promise, Mr. Spafford again wrote to the Secretary, Dec. 10, 1888, as follows:—

"We have had a meeting of the board of health to see if it was the right thing to do to have the surplus water drawn from Lake Ann. We were all of the opinion that it was not. I went to the lake to see how much the water has been raised, found it had been raised about three feet. There has been no sickness around the lake that I am aware of this summer. One member of the local board of health lives close by the lake and he says he has heard of no sickness. Mr. Seeman is using the water now to run his logs.\* \* This township has been fortunate in escaping contagious diseases." \* \*

#### MILL POND AND DAM CONSIDERED A NUISANCE.

John S. Caulkins, M. D., wrote to the Secretary from Thornville, Dec. 21, 1888, as follows:—

"Can you inform me how to proceed to get an old mill-dam down that has become a nuisance? It would be more correct to say that the mill-pond was the nuisance. The mill has made no flour these three or four years and never will again. Now and then grinds a little feed, but a very small amount of that. The community around us would be glad to learn the legal way to get the dam down this winter. I have been under the impression that it needed an act of the Legislature. Should you know any better way we should be glad to know of it."

In reply to Dr. Caulkins, the Secretary wrote to him Dec. 24, 1888:—

"I send you herewith a reprint from the Annual Report of this Board, in which I have marked paragraphs of interest to you in connection with the abatement of nuisances.

"The local board of health is authorized to examine into all nuisances, etc., and prevent or remove as the case may be. However, the local board of health declaring a thing to be a nuisance does not make it one if it is not one in fact; and in all cases where there is not a plain, adequate and complete remedy at law, the *circuit court of the county* (or the circuit judge sitting in chambers) has equity jurisdiction, with authority to grant injunctions to stay or prevent nuisances. If the board of health refuses or neglects to make proper complaint for the abatement of a nuisance, any one injured or annoyed thereby may do so.

"I am inclined to agree with you that perhaps the safest and surest way of preventing the nuisance would be by legislative enactment."

#### CAN A LOCAL BOARD OF HEALTH DELEGATE ITS POWERS TO THE HEALTH OFFICER.

April 30, 1888, J. T. Ficklin, health officer of Ogemaw township, Ogemaw Co., wrote to the Secretary of this Board:—

"Will you advise me how to proceed in enforcing health act No. 136, Public Acts of 1881, relative to privies and water-closets. Our prosecuting attorney is too busy with circuit court matters to give me the advice I want, at present, and I am anxious to have these places cleaned up before the hot weather comes on. Inclosed find copy of resolutions, which I am told will not fill the requirements of the act, also copy of notice which I have served on one man at two different times this spring, and which he has disregarded and ignored.

"Any information or reference as to what certain form of regulations, or in what manner it will be necessary for me to proceed to enforce this act, will be thankfully received."

The *Resolutions* and *Notice* referred to in the foregoing letter are as follows :—

" Regulations of Board of Health :—

" Public Notice is hereby given, that the following regulations were made and adopted by the Board of Health of the township of Ogemaw, in the county of Ogemaw, at a meeting of said board held in said township on the 16th day of April, 1888 :

" *Be it Resolved*, That the health officer be and is hereby authorized and instructed to use the full powers and authority of the board of health of this township, in the inspection, disinfecting, cleansing and abatement of all nuisances, privy vaults, and all sources of filth, which in his opinion may be or is injurious to the health of the inhabitants of said township, at such times and in such manner as he may direct, in accordance with the laws made and provided in such cases.

" *And be it further Resolved*, That the health officer be and is hereby instructed to post up five copies of above regulations, in five of the most public places in said township.

" Dated the 16th day of April, A. D. 1888.

JNO. T. FICKLIN, Supervisor and Health Officer,  
GEORGE R. HAMILTON, Justice of the Peace,  
L. B. DONOVAN, Justice of the Peace,  
H. E. DEWITT, Town Clerk,

*Board of Health of Ogemaw Township."*

" *To J. E. Merrick, Ogemaw Springs, Mich.:*

" The undersigned board of health of the township of Ogemaw, in the county of Ogemaw, having found upon the premises of the Commercial Hotel, in said township, occupied by you, a certain nuisance and source of filth, to-wit : the two privies situated on said premises near to and used by inmates of said hotel, which said nuisance and source of filth, in our opinion, may be and is injurious to the health of the inhabitants of said township, now, therefore, you are hereby ordered to remove the contents of said privy vaults, to such place as the health officer may direct, at your own expense within twenty-four hours after the service of this order upon you, under the penalty provided by law in case you neglect to do so.

" Dated this 18th day of April, A. D. 1888.

JOHN T. FICKLIN, Supervisor and Health Officer,  
GEORGE R. HAMILTON, Justice of the Peace,  
L. B. DONOVAN, Justice of the Peace,  
HIRAM E. DEWITT, Township Clerk,

*Board of Health in and for Ogemaw Township."*

In response to the foregoing communications the Secretary wrote to Mr. Ficklin, May 1, 1888, as follows :—

"In reply to your letter of April 30, with inclosed 'regulations' etc., it seems to me that the 'regulations' will not 'fill the requirements of the act,' because they attempt to delegate to the health officer or supervisor powers which properly belong to the board of health and which the law says the board of health shall attend to. The health officer is the executive officer of the board, but the board cannot delegate such of its powers away. The form of notice ordering the removal of the nuisance does seem to be proper, and, in my judgment, the proper step to take next would be to prosecute, as supervisor, in case the nuisance is not abated. As you will see from sections 105 and 108 on page 30 of the pamphlet sent you this day, it is the duty of the supervisor and of the prosecuting attorney to assist in such prosecution."

A noticeable feature of the communications received at this office during the year, relative to nuisances, is the large proportion of them which come from health officers and other township, city or village officials, asking for information relative to points of law concerning nuisances, or requesting instruction or advice as to their duties, or to the proper legal procedure necessary to effect the prevention or abatement of nuisances in general, or in specified cases. This is more satisfactory than would be the receipt of complaints of nuisances mostly from persons not officers.

For the information of those concerned, it may be stated here, that a compilation of the health laws of the State, including those which relate to nuisances, was made by the Secretary of this Board, and published in the Annual Report of the Board for the year 1883, and also in pamphlet form; and a later revised edition of the compilation, in pamphlet form, may now be obtained of the Secretary of the State Board of Health.

Respectfully submitted,

HENRY B. BAKER,  
*Secretary.*





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## ERRATA.

Page xiii., in sub-head, second line, for "FISCAL YEAR (NINE MONTHS) ENDING JUNE 30, 1889," read "FISCAL YEAR ENDING JUNE 30, 1889."

Page 182, bottom of fourth column of the first table for "44 1-6" read "14 1-6."

